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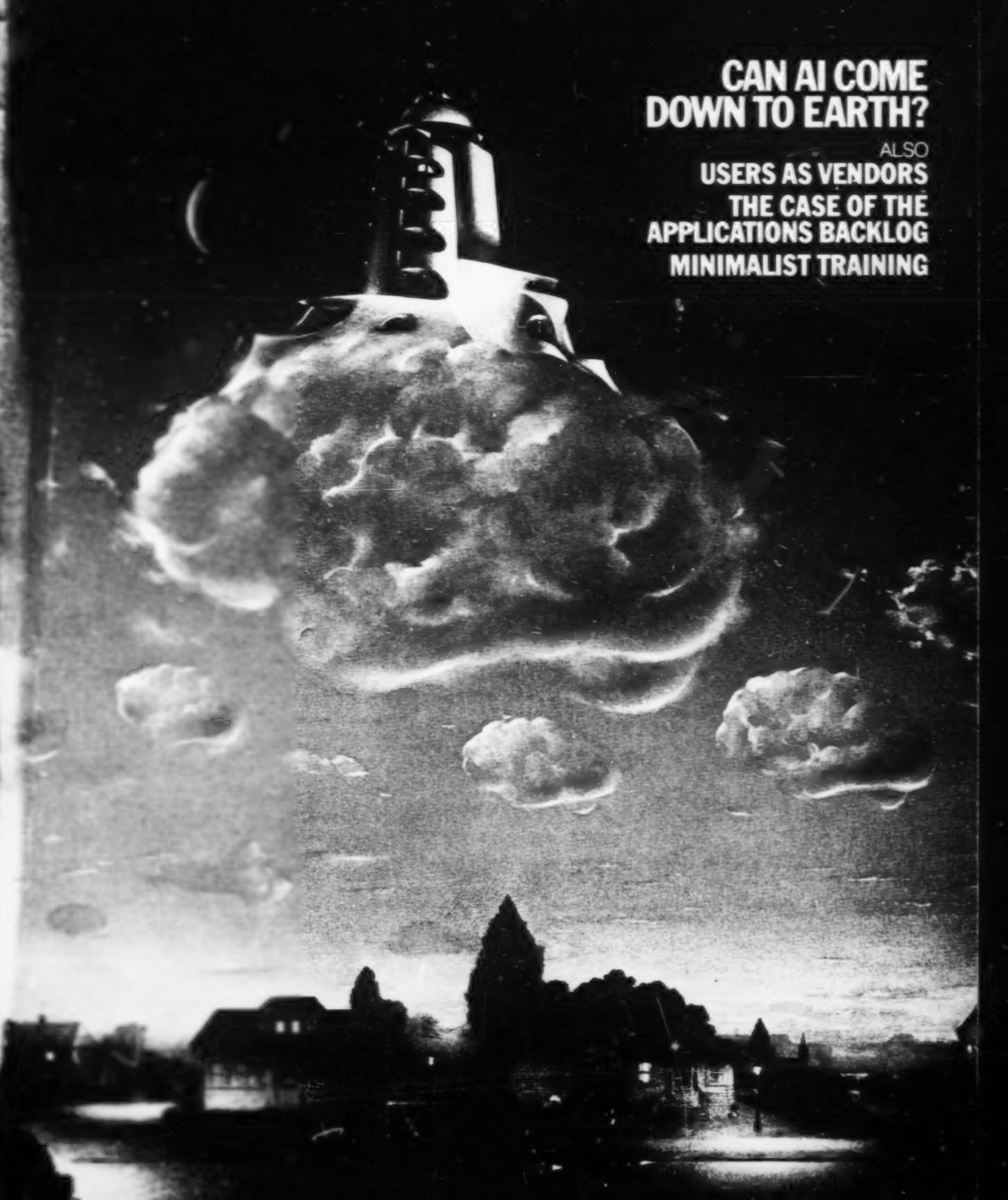

CAN AI COME DOWN TO EARTH?

ALSO

USERS AS VENDORS

THE CASE OF THE APPLICATIONS BACKLOG

MINIMALIST TRAINING

DATAMATION

NOVEMBER 1, 1984/$3.00 U.S.A.
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FEATURES

24
IN FOCUS

Turnabout is fair play, but is it good business? In "Users as Vendors," Nancy Welles describes how the marketplace is reacting to formerly inhouse software solutions.

76
THE OVERSELLING OF EXPERT SYSTEMS
Gary R. Martins

For applications of even modest complexity, most expert system code is hard to understand, debug, extend, and maintain. And then there's the pessimistic view. . . .

85
THE BLOSSOMING OF EUROPEAN AI
Paul Tate

By making modest promises and then delivering on them, expert system builders find fertile soil for their products.

92
AI AND SOFTWARE ENGINEERING
Robert Kowalski

Never mind promises of electronic psychiatrists and computerized warriors. Right now, artificial intelligence can be a valuable system development helpmate.

107
THE CASE OF THE APPLICATIONS BACKLOG
Kenneth E. Schoman Jr.

What was the sinister force thwarting end users? Who had held up defenseless software development? It was time for a hard-boiled investigation into project management.

115
ORIGIN OF THE SPECIES
Dan M. Bowers

Out of the primordial mists of pre-*Carterphone* and divestiture days, the modem has risen to take its place in the communication kingdom.

125
MINIMALIST TRAINING
John M. Carroll

How to simplify the tough task of learning computer systems.

NEWS IN PERSPECTIVE

34 **PERSONAL COMPUTING**
A PC and phone in one.

36 **SUPERCOMPUTING**
Amdahl's super cpu gamble.

42 **POINT OF SALE**
When one and one make one.

46 **MAINFRAMES**
Amdahl pushes Unix.
Spreadsheets for all.

60 **CAD/CAM**
A MAP for all vendors.

64 **BENCHMARKS**

DEPARTMENTS

9 **LOOK AHEAD**
15 **LETTERS**
21 **EDITORIAL**

141 **PEOPLE**
147 **HARDWARE**
155 **SOFTWARE**
163 **SOURCE DATA**
171 **MARKETPLACE**
174 **ON THE JOB**
177 **ADVERTISERS' INDEX**
181 **READERS' FORUM**

INTERNATIONAL 136-1

-3 **DEALING WITH THE DOLLAR**
-10 **JAPAN'S PC PLUNGE**
-16 **EUROPE SOUNDS OUT SPEECH SYSTEMS**

COVER ILLUSTRATION BY
RICHARD BOBER

The high dollar has given headaches to Uncle Sam's dp vendors overseas.

DEALING WITH DOLLARS

by John Lamb and Paul Tate

While the soaring dollar may be a feather in President Reagan's cap, it's clipping the commercial wings of American data processing companies doing business abroad.

Each time the dollar shoots up another point, Yankee profits from overseas operations take a nosedive. This inexorable process, which has steadily been eroding earnings for the last five years, is forcing U.S. firms to find new ways of operating on foreign shores.

One U.S. company that's been hit hard by the dollar surge is Sperry. Back in 1982 the company blamed the strong dollar for slashing $140 million off its annual sales. Since then, revenues from its European and African operations have plummeted almost 25%, going from $1.3 billion in 1982 to just under $1 billion in fiscal 1984.

A glance at the currency exchange table tells why Sperry, along with other U.S. companies, has been caught in the dollar trap. By mid-August, the dollar was trading at an 11-year high against the deutschmark and at record levels against the pound sterling and French franc. Since 1980 the dollar has skyrocketed 40% against the major currencies.

The strong dollar has had a double-whammy effect on American dp firms. First of all, it makes their U.S.-manufactured products more expensive in overseas markets. As one European industry observer quipped, U.S. products are now "overpriced, as well as oversold and over here." Secondly, the soaring dollar significantly cuts into the profits remitted to the U.S. parent.

IBM, the number one company in European dp, makes this point with predictable sobriety in its latest annual report. Noting the "adverse impact" of the strong dollar on overseas profits, Big Blue explains that "as the dollar strengthens, net assets and net earnings recorded in local currencies are translated into fewer U.S. dollars than they would have been at the previous year's rates."

To get some of those bucks, IBM, along with other U.S. multinationals, has increased prices, particularly on the software side. This move has caused chagrin among European users, who have bitterly complained through their local user groups. Hardware products have escaped the price hikes, mainly because IBM manufactures much of its product range in Europe. The company operates 15 plants in seven different countries, churning out wares that are worth around 90% of its total European sales.

Big Blue boasts a strong European presence. The company, which employs about 100,000 people in Europe, runs nine R&D facilities and five scientific centers. Last year the company invested $1.5 billion dollars in Europe, bought $1.8 billion worth of goods and services from local suppliers, and paid a cool $1.25 billion in local taxes.

IBM is also increasing its market share in Europe. The company's European sales in 1983 represented 42% of the total revenues earned by the top 25 dp companies in Europe (see "Crowning Europe's Dp Royalty," Aug. 1, p. 136-5). IBM Europe is nevertheless adding less to the corporate coffers as the years go by. In 1979, IBM Europe accounted for 40% of the company's total business, compared with the 27% it contributed in 1983. At fault is the currency slide, which has also clouded IBM Europe's profit picture.

FIG. 1

THE U.S. TOP 10 IN EUROPE

Company	1983 DP Revenues In Europe ($M)	1983 Total Revenues Worldwide ($M)
IBM	10,758	40,180
Digital Equipment	1,107	4,827
Burroughs	977	4,389
Hewlett-Packard	814	4,858
Sperry	705	4,745
NCR	683	3,731
Control Data	617	4,580
Honeywell	484	5,753
Wang	346	1,792
Xerox (Rank Xerox)	206	8,463

Source: DATAMATION European Top 25

"From a bookkeeping point of view, it looks cheaper to operate in Europe."

"International operations are expected to return a contribution that will add to the dollar profits of the company," explains Robert McMicking, Digital Equipment Corp.'s business finance manager in the U.K. "But with the currency situation, two things happen: absolute profit goes down and marginal profit gets hit too."

With this sword of Damocles hanging over them, American companies have four options, according to McMicking. They can cut local spending, sell more products, increase the overseas content of those products, or raise prices.

HIGHER PRICES NO PROBLEM

DEC has been upping prices in the U.K. every six months for the past three years. McMicking claims these price increases have had little impact on DEC's market share. "We have taken pricing action when others haven't," he says, "and it hasn't hurt us."

DEC has also begun investing heavily in European plant. It recently opened a $30 million chip facility in Scotland, and a mass storage production factory in West Germany. A new peripherals manufacturing facility in France will also be in operation soon. The mini maker has plowed still more capital into remote diagnosis and repair facilities—something it really needed, since until recently the company used to return machines to the U.S. for repair.

McMicking is candid about DEC's manufacturing efforts in Europe. "Setting up manufacturing is difficult and I'm afraid it has been a question of too little, too late at Digital. But I am not sure how many people would have looked into their crystal balls three years ago and seen the pound drop in relation to the dollar from 1.9 to 1.28, where it was this summer."

Hardware companies like DEC are particularly vulnerable to the strong dollar syndrome, especially when they do little or no local manufacturing. Data General, which imports all its systems into Europe, is in that vulnerable category. Bill Cadogan, a European marketing manager for DG, puts a brave face on the problem. "We have adjusted our prices," he says, "but we have also totally redeveloped our product line with systems that have strong price/performance."

Data General customers faced price hikes in August, but Cadogan claims his company has been able to conceal higher margins because of the price-performance of the MV supermini range.

Data General also claims that the higher prices have not resulted in lower sales, though Cadogan admits there is a limit to customers' patience. He maintains that the British market is very buoyant. This buoyancy, coupled with "substantial increases in sales productivity," has helped the company maintain its market position in Europe.

At Memorex, international president Lars Turndal is not so sanguine. "We are losing market share every day, particularly to European companies," he says. "I am really suprised that anyone can tell you differently." Turndal, who oversees operations in 26 different countries, believes that many U.S. dp firms were caught unawares by the dollar dilemma.

"We saw what was coming early and began investing in local plant, increasing prices, and hedging on the foreign exchange markets," he says. In Latin America, for example, Turndal demanded payment in dollars, instead of local currencies.

"When you are a multinational there are several things you can do," Turndal explains. "You can buy forward currency—called hedging—and you can try to source more products outside the U.S. We do this particularly in Italy, Sweden, and Japan. Looking overseas for products is good in its own right: they don't know everything in the U.S."

Despite all their efforts, Memorex is still finding the going tough in Europe, especially in Great Britain, West Germany, and Switzerland. Turndal feels the problem is complicated by sudden swings in exchange rates. "Our biggest concern is whether the business we conclude today is going to be profitable in six to eight weeks' time when we deliver," he says. Memorex's oem customers are currently being offered dollar clauses in their contracts. If the dollar goes up before delivery, they pay a supplementary fee. If it goes down, they get a refund.

But Turndal must tread warily as he balances currency shifts with price increases. In addition to buying foreign ex-

FIG. 2

EUROPEAN CURRENCY TABLE

	1980	1981	1982	1983	1984
German mark	1.9590	2.2548	2.3766	2.7238	2.7842
French franc	4.5160	5.7480	6.2750	8.3475	8.5445
Pound sterling	.4192	.5241	.6194	.6894	.7393

Source: Economist Intelligence Unit

STRANGERS IN PARADISE

While the strong dollar may be giving U.S. companies a hard time in international markets, their employees with dollar-based salaries are having the time of their lives.

A report from The Conference Board in New York reveals that since 1983, costs for Americans working abroad have fallen in 18 of the 20 major cities around the world. The American in Paris, Copenhagen, or London can expect to buy more food, clothing, and medical care for his dollar.

In Copenhagen, for example, living costs, excluding housing, have dropped to an average of $26,102 a year from $31,993—the biggest improvement recorded by The Conference Board. In London, the story is the same. A $60,000-a-year executive on average spends $25,757 on general living costs compared with $27,507 last year.

"It is heaven for Americans who are over here on short-term contracts," confides one U.S. executive in Frankfurt. "The dollars keep coming in, and their value keeps going up. It is a time when Americans abroad can live in a little more luxury than they are used to."

One AT&T staffer in Europe who gets paid partly in dollars and partly in the local currency, admits that he makes "more money when the extra living allowances are added on." But he also adds that his living standard "is about the same as in New Jersey."

These good times however, can't go on forever. J. Frank Gaston, The Conference Board's head of special international studies, points out that "it isn't quite paradise. U.S. companies soon catch on to the fact that they don't have to pay so much in living allowances, so these are often reduced."

Every paradise has its problems.

—P.T.

The strong dollar should be a heaven-sent opportunity for European firms.

change on the futures markets, Memorex can also exploit the relative strengths of different currencies by transferring product manufacturing to countries that have weaker currencies. "There is a limit," notes Turndal, "to what we can do in this way."

INVESTED HEAVILY IN PLANT So far, Memorex has sunk some $8 million into plant in Europe. The Irish, who offer generous incentives to foreign businesses, have picked up $6 million of the Memorex plant tab, while the Belgians have pulled in the remaining $2 million over the past three years. Such outlays, Turndal points out, look good to the accountants back home. "From a bookkeeping point of view, it looks cheaper to operate in Europe." With a strong dollar, American companies investing abroad get more for their money.

Accounting procedures, however, can cause additional headaches for European subsidiaries that are forced to value all their business in dollars. Take the case of Wang. At the beginning of the year, the company sets its annual sales targets to meet corporate goals. The cost of products that are made in Europe are quoted in dollars. These figures are adjusted monthly to take into account the currency changes. As a result, Wang's profit margins are squeezed every time the dollar rises in international currency markets.

There is another problem. While Wang's sales staff can easily surpass its initial targets in the local currency, the strengthening dollar means it has to work much harder to meet the inflated dollar targets by the end of the year. The sales forces of a number of American subsidiaries are under intense pressure to compensate for the lackluster local currencies.

The strong dollar should be a heaven-sent opportunity for Europe's local dp companies, which are taking a beating in the marketplace, both at home and abroad. The European Commission estimates that its member states, which racked up a $1.7 billion deficit in dp products last year, are losing market share around the world at the rate of 1% a year. European firms, with few exceptions, have not turned the Yankees' dollar dilemma to their advantage.

OWNER'S MANUAL
DIGITAL ALARM CLOCK
CHENEY

"Step two: be sure not to press the small, blue button labeled 'reverse' on the back panel."

CARTOON BY THOMAS CHENEY

"Although the dollar is almost 15% stronger against the lira than it was in June 1983, it does not seem to have affected the sale of American dp equipment," observes an official at the U.S. Department of Commerce in Milan. "Italian companies seem willing to pay the price for American dp equipment, no matter how much it costs, because of their interest in modernizing their operations."

"It should be a bonanza for European companies like ICL," says Memorex's Turndal, "but I can't say that they are taking advantage of it." Turndal has, however, encountered pockets of resistance, particularly in Sweden, where Ericsson is very price-competitive.

Data General's Cadogan also feels that ICL has not made the best of the bad dollar situation. "There is no evidence that they are cashing in on a currency advantage. We have been cheaper than ICL on several recent occasions."

ICL itself confirms that the weak pound has not been turned to advantage, at least not in the U.S. "There is no evidence in the latest six-month figures of any export advantage from the currency situation," declares an ICL spokesman.

The truth of the matter is that the American industry is just too robust to let something like a high-flying dollar get in its way. As DEC's McMicking points out, "If you grow the size of your business you are getting margin increases that offset the currency increase."

The steady progress of American and Japanese companies on European soil is already sending cold winds down the corridors of power. A recent report by the National Economic Development Council in Britain speaks of a trade crisis in the dp industry, where the deficit is fast approaching $1.3 billion. To trim that trade deficit, NEDC recommends more training, more cash for R&D and smaller companies, and more public-sector procurement of British products.

American companies' worries about overseas profits are nothing compared to the fears European firms harbor about their long-term survival. And, in fact, American dp companies seem to be coping quite well in the marketplace, despite the strong dollar—a situation they will just have to learn to live with. Indeed, the latest economic forecasts show little change in the dollar's status between now and the end of the decade.

The American eagle has definitely landed in Europe. Determined to cope with the soaring dollar, the U.S. dp industry will continue feathering its comfortable European nest. ●

DATAMATION

84

NOVEMBER 15

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BRANCH OFFICE MICROCOMPUTING

ALSO

MINI-MICRO SURVEY

BUSINESS GRAPHICS TRENDS

THE KING OF MALAPUTA

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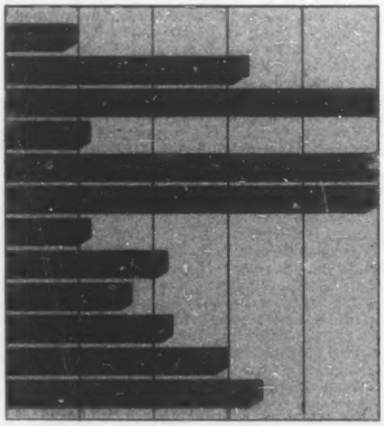
FEATURES

34
IN FOCUS
New small computer users are increasingly choosing micros over minis as their entry vehicles to the small systems market. John W. Verity reports on that and other trends in this year's "Mini-Micro Survey."

104
BRANCH OFFICE MICROCOMPUTING
Perry Petersen
The result is an effective blend of local autonomy and central control at one company where branch offices "hire" the main office's dp staff to help set up their micro operations.

113
MANAGING THE PC REVOLUTION
Eric E. Vogt
To do it, dp managers must evolve from the master chefs of the mainframe-oriented shops of yesterday to the short-order cooks of user services of today.

119
BUSINESS GRAPHICS TRENDS
John A. Lehman, Doug Vogel, and Gary Dickson
Despite recent enthusiasm for business graphics, little is known about its current or potential use. A new survey has some answers.



127
THE KING OF MALAPUTA
Sol Yurick
Was his threat to the world real? Or was it just monetary? Was there a difference?

141
IS PROGRESS WHAT IT SEEMS TO BE?
David F. Noble
In an excerpt from his new book, a controversial historian of technology explores the destructive ramifications of technological progress, and accuses scientists and engineers of being its servants, not its masters.

159
LEADERSHIP IS CRUCIAL
William C. Kimmerly
The effective dp manager must be particularly adept at developing and maintaining a balanced control framework.

NEWS IN PERSPECTIVE

56 **EXPORTS**
Back to ground zero.
58 **SOFTWARE**
A game without rules.
66 **TELECOMMUNICATIONS**
We want Unix: MITI.
Japan bets on fiber.
80 **DATA CENTERS**
Quake and shake.
96 **SAFETY & HEALTH**
Toxic shock troops.
100 **BENCHMARKS**

DEPARTMENTS

8 **LOOKING BACK**
13 **LOOK AHEAD**
18 **CALENDAR**
23 **LETTERS**
31 **EDITORIAL**
173 **HARDWARE**
182 **SOFTWARE**
192 **ON THE JOB**
194 **MARKETPLACE**
197 **READERS' FORUM**
202 **ADVERTISERS' INDEX**

OEM SUPPLEMENT 169-1

-5 **PRINT UP A STORM**
-14 **STAYING ALIVE: HOW TO WRITE A CONTRACT**
-17 **DENTISTS NIBBLE AT OFFICE AUTOMATION**

COVER PHOTOGRAPH BY STEVE COOPER

IN FOCUS

UPSTARTS OUTSHINE THE STARS

The personal computer, in its many guises, is taking most of the glory away from traditional minicomputers.

by John W. Verity

Driven by strengthening user interest in office systems and workstations, the personal computer continues to gain importance at the expense of the traditional minicomputer. More than ever, new applications are being written for micros rather than minis. What's more, the IBM PC has apparently become the main element of that company's low-end business, working as a strategic vehicle for gaining new customers for all product lines.

These and other important trends were revealed in the 1984-85 Mini/Microcomputer Survey conducted last July by the stock brokerage firm Cowen & Co., Boston, in conjunction with DATAMATION. The survey is based on 6,264 unduplicated responses from individual user sites in the U.S., who reported a total of 26,778 minicomputers installed. As with previous surveys in this series, the respondent population is weighted heavily toward user sites where mainframes are installed. Almost nine out of 10 respondents, moreover, were end users, as opposed to oem/system resellers.

Among the special issues focused upon this year were the emergence of AT&T as a minicomputer and personal computer supplier, the use of local networks, and corporate use of personal computer software products. Additionally, measurements were made of users' loyalty to prime vendors, future spending on processors and peripherals, and their interest in the Unix operating system.

New users of small computers are increasingly choosing micros as their entry vehicles to the small systems market, which is not surprising, given the recent boom in personal computer manufacturing and marketing. The usage of workstations, measured explicitly for the first time in this year's survey, also took away from minicomputer growth. Whereas five years ago the eight-year compound annual growth rate for minicomputer shipments was measured at 23%, this year it stayed at the same 16% level as last year.

The two vendors showing the strongest growth in terms of purchases by users new to the mini industry were Apollo Computer Inc., Chelmsford, Mass., maker of engineering workstations, and Altos Computer Systems, San Jose, Calif., which makes microcomputers. In terms of new users of small systems, the office systems and workstations categories showed the most pronounced growth, while the rate for traditional minis dropped once again.

Despite the incursion of the personal computer, however, minicomputer shipments during the year ending June 1985 should grow by 25% in dollar terms compared with the previous year. This is almost double the comparable figure recorded in last year's survey, 13.9%, and is attributable mainly to strength in the oem/systems house segment of the market. (These figures are adjusted for new user expansion of the marketplace.) Growth prospects for individual suppliers relative to the overall average are a function of product positioning within the industry. Thus, traditional minicomputer suppliers will see only nominal shipment growth, small business systems suppliers a 21% rate, office systems vendors 34%, and workstation manufacturers 110%.

Personal computers, of course, will far outpace the minicomputer in terms of near-term growth: pcs should enjoy a rise in dollar shipments of 63% for the year ending June 1985, Cowen says. In fact, in the context of the survey, pcs will account for 32% of the dollars spent on small systems by respondents from July 1984 through June 1985, compared with 27% recorded for the same period a year earlier.

The eight-year compound growth rate of minicomputer shipments has stayed at the 16% level.

Looking further ahead, however, to the 12 months ending June 1986, a rising percentage of respondents indicated that their minicomputer spending would probably be less than during the previous year. That fits a general long-term pattern of moderating minicomputer shipment growth foreseen in the past several years. The slowdown is most pronounced at the high end of the minicomputer spectrum but is partially made up for in the low end, where workstation and personal computer business will be far more upbeat. For instance, three times as many respondents are planning to spend more rather than less on personal computer purchases in the 1985-86 period.

The rate of new sites joining the ranks of personal computer users dropped off dramatically, showing only 55% growth this year compared with 130% the year before, but it is still a substantial source of new business for vendors, given the fact that many more

SCENE FROM "ALL ABOUT EVE"/PHOTOTEQUE

billions of dollars are now involved. Apple Computer and Tandy Corp., two early entrants in the pc business, showed new user growth rates markedly lower than later arrivals like IBM and DEC. In the corporate marketplace, IBM has established a commanding lead of 58.4% of first-time users, compared with Apple's 7.4% and DEC's 8.1%. Just two years ago, Apple's share of new users was 26.7%.

Once again, those respondents buying pcs are turning more often than not to centralized control of their buying processes. Among organizations whose annual revenues exceeded $250 million, for instance, almost 70% said they centralized purchase of pcs. Among those same respondents, 45% buy direct from the manufacturer and 45% buy from independent computer stores.

In terms of sites, the independent store is the primary channel of distribution to respondents, but in terms of units purchased, the leading channel is direct from a vendor. Sales through independent stores were heaviest for portables from Compaq Computer Corp., Houston. Independent stores also figured heavily in hardware maintenance, particularly in the Apple and IBM-compatible segments of the market.

While the reselling of personal computers was present at only 9.4% of all responding sites, sites whose primary suppliers were Texas Instruments and Data General showed particularly heavy activity, an indication that TI and DG are focusing their attention on the value-added reseller and oem channels rather than on the more difficult direct confrontation with IBM and Apple.

As in surveys past, the availability of quality software is by far the most important criterion cited by respondents in choosing a personal computer vendor. Following that are the issues of compatibility (a close second), product reputation, price, ease of learning, and memory capacity.

Pc software purchases continue to be limited largely to a small number of popular packages. The 1-2-3 integrated spreadsheet and database from Lotus Development Corp., Cambridge, holds a commanding lead in popularity among users of IBM PC-type equipment, followed by Wordstar, dBase II, and VisiCalc, in that order. For the most part, users tend to rank the quality of packaged pc software above that available for their minicomputers. The ranking of types of applications run by users—word processing, spreadsheets, etc.—are relatively consistent across all major vendors' lines. Except in the case of DEC, whose users spend more time on word processing, spreadsheets are the leading application, followed by word processing, remote terminal emulation, database management, and graphics.

The heaviest actual use of the personal computer was found in educational sites, where approximately 6.1 hours a day were put in on each machine. The average across all pc sites was 4.8 hours a day. The educational market continues to grow, with an average of 29 machines purchased at each such site (the overall average was 16 machines per site). Apple seems to have lost its lead in the educational sector in this survey population, showing a 28% share compared with IBM's 38%.

One of the most notable trends seen in the low-end computer marketplace is the ground swell of standardization on the IBM PC and work-alike products. No matter which vendor is cited by users as their primary minicomputer supplier, they more often than not list IBM as the primary supplier of personal computing equipment. In the context of the survey, in fact, IBM is on the verge of achieving a majority of market share for sites with PCs installed, Cowen reports. The company shows a 48.7% share of those sites, followed by Apple with 13.4%, DEC with 5.9%, Compaq with 4.7%, Hewlett-Packard with 4.1%, and Tandy with 4.2%. Just three years ago, Apple's share of the sites was 42% and Tandy's 26.1%.

Workstation suppliers are among the most vulnerable to user defections from their customer bases.

As for machines planned to be purchased through the end of next year, IBM was cited as the primary supplier at 55% of the sites, followed by Apple at 8% and DEC at 7%. In a related development, DEC and Data General's pc sales seem to go mostly to their installed customer base. Whereas IBM will ship 64.5% of its PCs to respondents who don't use its minis, DEC's and DG's comparable figures are only 7.5% and 7.7%, respectively.

Apple has apparently done well with its Macintosh product. Of those 1983-84 Apple computer purchases mentioned by respondents, 42% of the units were Macs and 34% Apple II class machines. Those two models account for 55% and 29%, respectively, of units planned to be purchased through the end of 1985. The more expensive Lisa machine, however, shows a small and shrinking importance in Apple user buying plans.

Turning to minicomputers, the survey found that the mix of technical vs. business/commercial applications on minicomputers is a source of continuing strength for Digital Equipment Corp., the

FIG. 1

TOP DOZEN MINICOMPUTER SYSTEMS 1984/85

A. BASED ON NUMBER OF RESPONDENTS ACQUIRING SYSTEMS (7/84–12/85)

MANUFACTURER	SYSTEM	HOW MANY SITES ACQUIRING	AV. UNITS/ SITE
DEC	VAX-11/750	181	1.5
IBM	System/36	173	2.6
DEC	VAX-11/780	131	1.4
DEC	VAX-Unspecified	80	5.9
IBM	Series/1	70	3.3
DEC	VAX-11/785	65	1.6
HP	3000-Unspecified	57	1.6
DEC	PDP-11/44	40	1.5
IBM	System/38	40	1.1
HP	3000/68	37	1.1
DEC	PDP-11/23, 23-Plus	31	9.4
DG, DEC	MV/8000; VAX-11/730	30 each	4.0, 1.7

B. BASED ON NUMBER OF UNITS BEING ACQUIRED (7/84–12/85)

MANUFACTURER	SYSTEM	HOW MANY UNITS BEING ACQUIRED	EST. VALUE ($ MILLIONS)
Apollo	Unspecified	3,621	$181.4
DEC	VAX, Unspecified	489	62.6
IBM	System/36	451	27.7
Burroughs	B20/B25	366	2.7
Data General	Eclipse, Unspecified	308	40.7
DEC	PDP-11/23	292	4.1
DEC	VAX-11/750	275	40.5
NCR	Tower	273	3.8
IBM	Series/1	230	18.3
DEC	PDP-11/73, 78	184	1.7
Honeywell	DPS-6, Unspecified	184	14.3
DEC	VAX-11/780	181	60.5

FIG. 2

INDUSTRY PRICING TRENDS

Query: How big a price concession (above and beyond any normal quantity discount) did you receive when acquiring your last minicomputer system(s)?

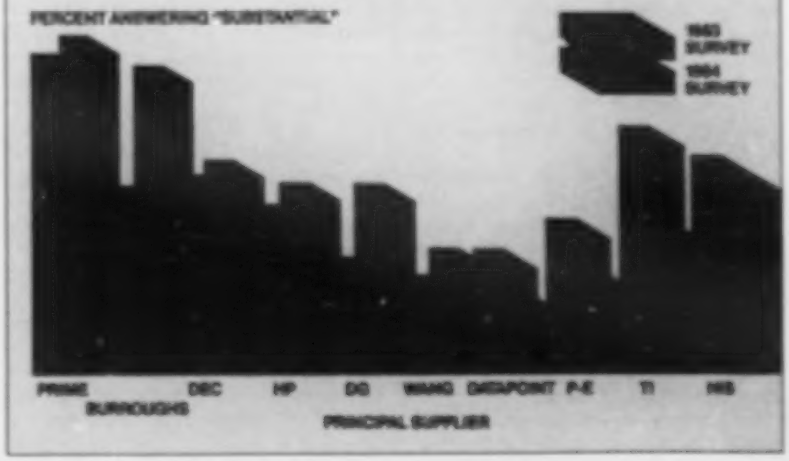


FIG. 3

MINICOMPUTER SELECTION CRITERIA

Query: Which of the following factors were most important in your choice of a mini vendor?

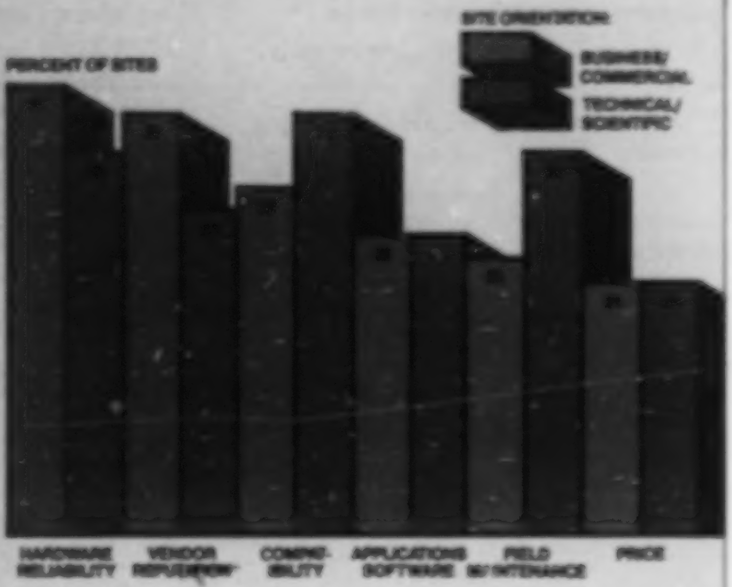
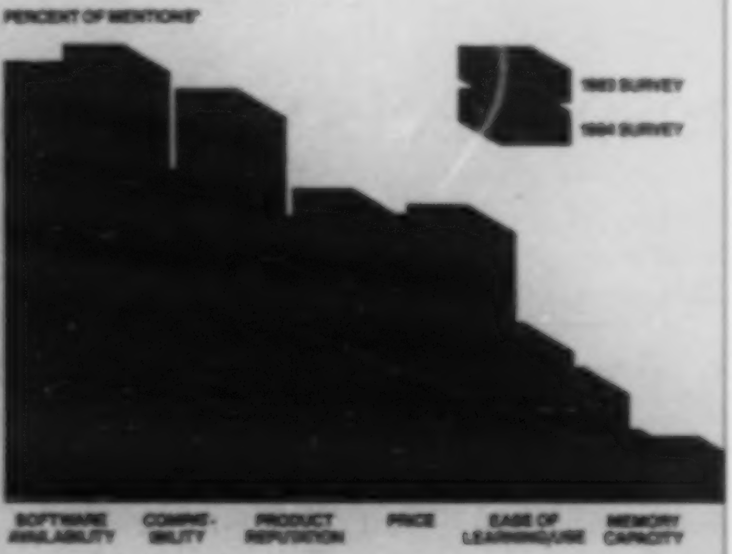


FIG. 4

PC SELECTION CRITERIA



*Each respondent asked to specify no more than three criteria

leading mini supplier, in technical markets. This connotes, however, a disappointing showing by DEC in the faster-growing commercial mini market: the Maynard, Mass., company showed little if any additional penetration of the commercial sector and it continued to rank below the industry average in several subcategories. DEC's business continues, moreover, to be strongly dominated by minicomputers and not by the faster-growing personal computer.

AT&T, which formally entered the merchant minicomputer market this year, was found to have its strongest market penetration in shops doing software development systems, which follows from the Unix orientation of its hardware. It also showed strongly in education and timesharing markets.

When asked about the availability and quality of minicomputer applications software packages, DEC and Hewlett-Packard were most highly rated by respondents; Perkin-Elmer and Sperry were lowest.

As in the past four surveys, hardware reliability was named by users as the most important factor in choosing a minicomputer. This was especially true in commercial and business-oriented users. Technical and scientific sites were more likely to name field support and prior systems compatibility as the key factors. Other factors taken into consideration were vendor reputation, availability of applications software, and pricing. Users of IBM minis most often cited vendor reputation as the main criterion in their choice, while those using AT&T's 3B machines found the machines' strength in Unix most important. Wang Labs scored high with users looking for a "full systems line."

Tandem and Apollo users are most heavily into networking.

Asked over the years if they expected to change primary vendors of minicomputers, about four fifths of the respondents have said no. This year was no exception: 83.9% said no, 7.3% said yes, and 8.8% (down from as much as 11.3% in previous years) said they were seriously considering a switch. The vendors most likely to see users leave their fold, according to the survey, are Basic Four, Datapoint, and Four-Phase.

IBM and HP seem to have the highest loyalty among users, with only 9.1% of their users planning or considering a switch. Tandem Computers Inc., Cupertino, Calif., however, this year showed 14.3% of its users planning a switch, up dramatically from the 5.9% figure in last year's survey and a 0.0% rating in 1981. Also vulnerable, according to this year's survey, are workstation supplier Apollo Computers and microcomputer vendor Altos, with 33.3% and 40%, respectively.

Software support, or the lack thereof, was cited most often by end users as the reason for considering a switch of vendor, while oem/systems house respondents cited faults in the vendor's sales and service organization.

The past trend toward single-supplier procurements has seen a reversal, suggesting a reintensifying of competition in the small business and office systems market segments. In other market segments, however—namely, traditional minis and intelligent terminals—more single-source procurements indicate a consolidation favoring established suppliers. Respondents indicated they enjoyed discounts from vendors when they were able to call in more than one supplier on a procurement.

Users rated Hewlett-Packard and DEC highest for availability of quality applications software.

A key measure of industry performance in the mini and personal computer markets is the purchasing plans users have for peripherals. This year's survey found 20MB to 100MB hard disks and tape drives to be the most active peripherals segments in terms of planned shipments. Disk storage capacities were found to be growing at better than 30% a year on a six-year compound basis. The average attached minicomputer disk storage is 344MB, compared to 275MB last year. Tandem cpus are equipped with the most disk storage, over 1GB, at the time of shipment. In the tape drive arena, Cipher Data Products, San Diego, will enjoy a 21.4% share of planned purchases for the 18 months ending December 1985.

Main memory for minicomputers among survey respondents has grown even faster than disk, at over 50% a year on a six-year compound basis. The average main memory size of minicomputers is now 1.396MB, compared with 950KB last year. This obviously reflects the continuing drop in semiconductor memory prices. Tandem machines are shipped with the most main memory, some 2.9MB.

Growth of main memory on personal computers is even sharper, hitting 61% on a four-year basis, compared to a 45%, four-year rate for minis. The average pc is shipped with 287KB of main storage, compared to 196KB last year. It seems safe to say that growth in this segment will be even stronger now that more powerful micros are coming into the market, and many vendors are now bundling 256KB as a minimum configuration for their pcs.

Looking at minicomputers that re-

FIG. 5

NEW CORPORATE PC USERS CHOOSE IBM

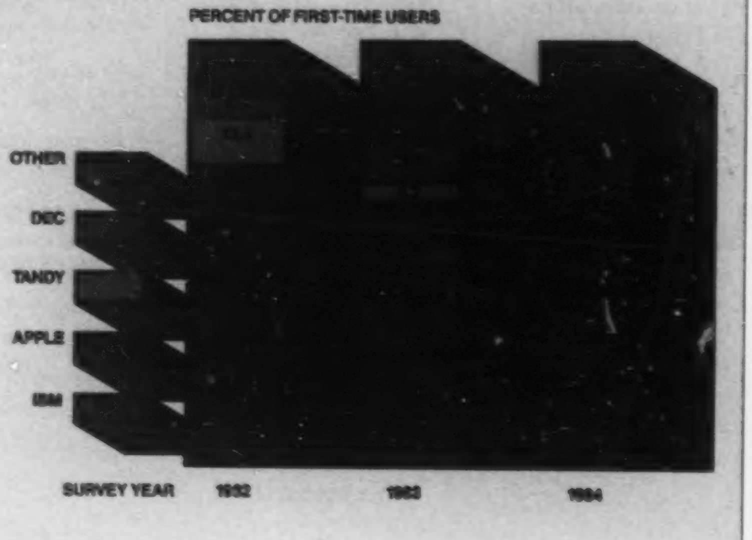
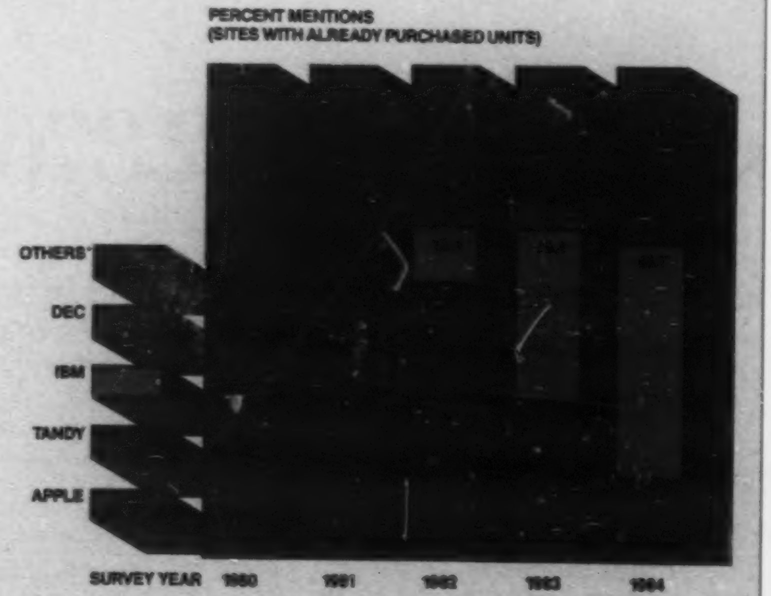


FIG. 6

IBM PC LEAD STRENGTHENING



*Included in "Others": Compaq 4.7%, HP 4.1%, Wang 2.3%, Zenith 1.4%, Kaypro 1.2%, TI 1.2%, Commodore 1.1%, etc. (the rest all less than 1%)

spondents reported having purchased during the past 18 months, the survey found some interesting patterns in price discounting. Price cuts were much more severe among the oem/systems house side of the market than among end users. The former received an average discount of 18.8% (above and beyond normal quantity discounts), while end users received only 10.7% breaks on the average. Altos came out as the heaviest discounter, offering an average of 57.1% off "normal" list prices. It was followed by Gould/SEL, Fort Lauderdale, (42.9%) and Convergent Technologies, Santa Clara, (40%). IBM and Tandem were the least likely to discount their machines.

Based on the number of sites that acquired a particular machine during 1983-84, DEC's VAX-11/750 was the most popular minicomputer: it was acquired by 232 sites, followed by IBM's System/36, which was acquired by 217 sites. Based on the number of machines acquired, Apollo earned the top spot with its Domain system, of which 1,411 units were acquired during the period.

With an eye to the next 18 months, oems and systems houses estimated their average on-hand supply of hardware was good for about 3.6 months, compared to the 2.8-month figure reported last year. That change may mean an eventual cooling off of order trends among these respondents. So far, however, few order delays or cancellations have been seen.

The most popular machine to be acquired by respondents in the coming 18 months should be the DEC VAX 11/750, which is in the purchasing plans of 181 sites, followed by IBM's System/36, being acquired by 173 sites. Based on the number of units being acquired during the same period, the Apollo workstation is the most popular—including one particularly large order calling for 3,621. The runner-up is the DEC VAX, with 925 machines of various models to be installed.

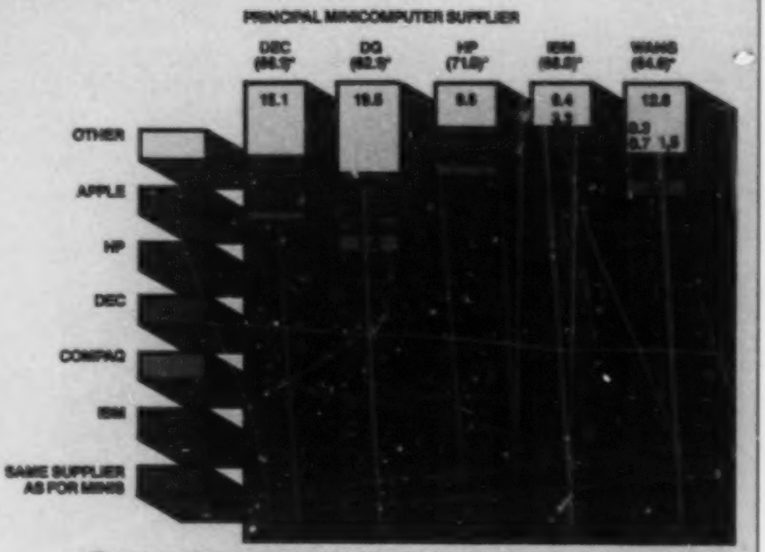
Respondents cite the availability of quality software as the most important criterion in choosing a personal computer vendor.

Digital Equipment still relies heavily on the VAX family of 32-bit processors, but the stage appears set for a sweeping product cycle transition. Industry watchers generally expect new VAX models to begin appearing this month or next, particularly the long-awaited Venus, which would top off the line. In fact, survey respondents indicated that 5.5% of their planned purchases of DEC equipment would be for the Venus model, compared to 22% for the model 11/785, 35% for the 11/780, and 23% for the 11/750.

FIG. 7

IBM PC STRENGTH AT MINI SITES

WHOSE PC(S) PLANNED FOR PURCHASE IN 1984/85

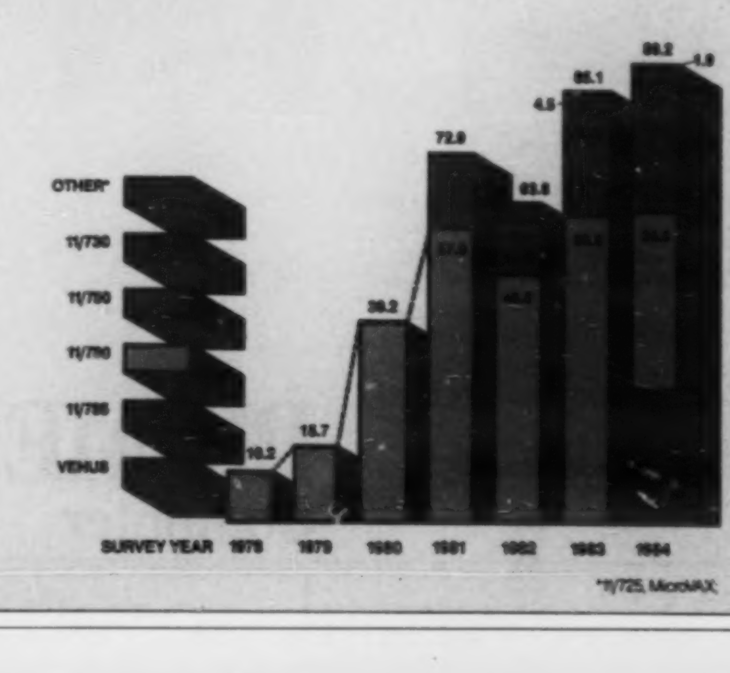


*Figures in parentheses represent percent of sites planning personal computer purchase during 1984/85

FIG. 8

VAX-11/780 STILL IMPORTANT TO DEC

VAX AS A PERCENTAGE OF PLANNED DEC SHIPMENTS (DOLLARS)



*11/725, MicroVAX

A decline in 11/780 installations is apparently being offset by rising 11/785 shipments.

Interestingly, Data General's standing in the overall minicomputer market seems to be on the rise. Whereas in the previous 18 months its hardware accounted for only 10.4% of the respondents' total spending on minicomputers, it expects to capture 12.4% of their dollars in the following 18 months. The warm reception given its line of 32-bit minis may be enough for it to gain market share from archrival DEC. Data General users indicated a planned increase in orders of MV/10000 32-bit machines at the expense of the MV/8000, while the MV/6000 has dropped almost completely out of the picture.

At Prime Computer, a sharp falloff in shipments of the models 550, 750, and 850 was foreseen, but those machines have been superceded by the 2250, 2550, 9750, and 9950. Prime users said they would spend 44% of their budgets through the end of next year on the 9950 and 21% on the 750.

IBM and HP seem to have the highest loyalty among users.

The use of AT&T's up-and-coming Unix operating system was found to be growing quickly, albeit from a small installed base. Only 7.6% of the respondents, most of them in the technical/scientific sector, said they were using Unix as their primary operating system at the time of the survey, but another 6.2% said they would have it installed by the end of next year. By that time, also, 18.2% of the respondents said Unix would have at least secondary status at their sites. Among those using Unix as the primary operating system, those sites involved in so-called artificial intelligence, communication, and CAD/CAM were the heaviest users of Unix. Over half the primary Unix sites said they used the software on DEC hardware, but by next year substantial showings were expected on IBM, HP, and even Wang computers.

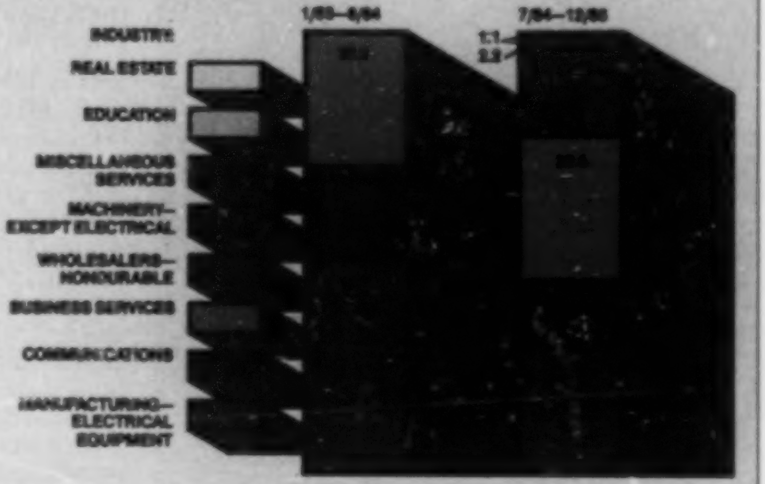
Use of remote minicomputer networks will grow substantially this year among respondents, 30% of which have such facilities installed and 18% of which will be making their first installations in the coming 18 months. And, as might be expected from the nature of their hardware, Tandem and Apollo showed top rankings in the usage of remote and local area networks, respectively.

Asked who their local area network suppliers were, respondents indicated that Ethernet was leading the pack, with 25% of the current and 44.5% of the planned installations, followed by Wangnet and DECnet. Interestingly, the local

FIG. 9

AT&T 3B SERIES SHIPMENTS

DISTRIBUTION OF 3B PURCHASES BY INDUSTRY



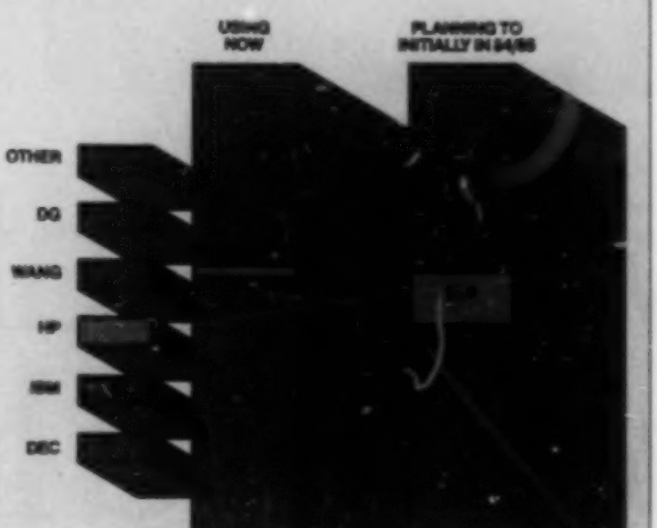
- Manufacturing—Electrical Equipment SIC includes old Western Electric
- Communications SIC includes the old Bell Operating Companies
- Business Services includes computer and data processing service (i.e., much of systems house population)
- Machinery—except Electrical includes office machine suppliers (e.g., hardware oems)

FIG. 10

UNIX USAGE BIG ON DEC SYSTEMS

Query: What if any plans do you have for the use of Unix (Ultrix, Xenix, etc) as your primary or secondary operating system?

PERCENT OF SITES ANSWERING "PRIMARY"



"STUDENTS WITH THE LEAST MONEY OFTEN HAVE THE MOST AMBITION."

CHARLES L. BROWN,
CHAIRMAN, AT&T

"What do you do if your dream is to go to college but your family earns less than $12,000 a year?

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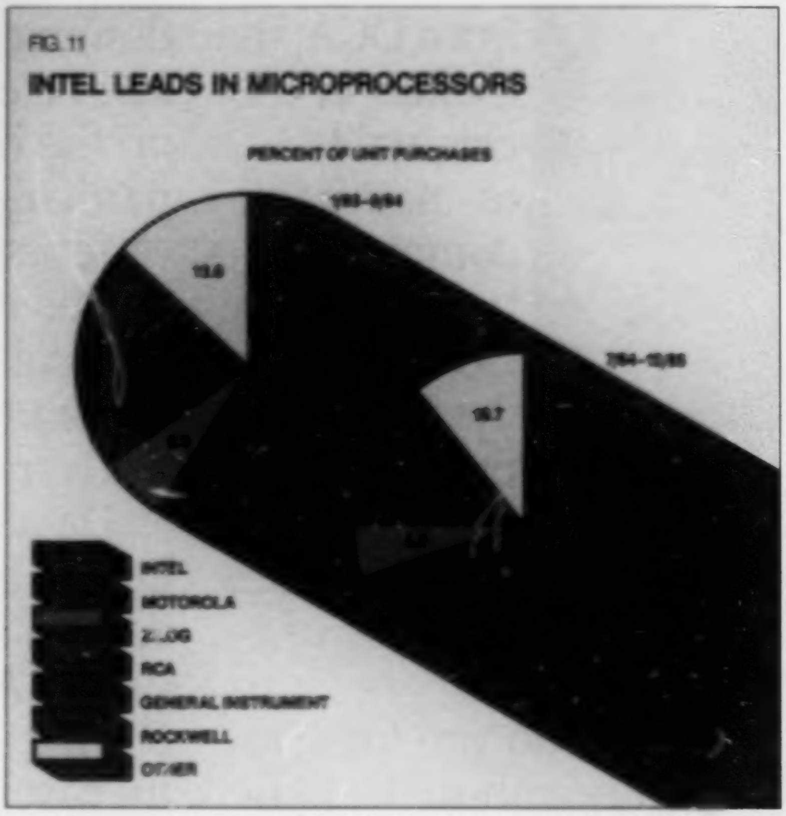
IN FOCUS

FIG. 11

INTEL LEADS IN MICROPROCESSORS



network appears to be ahead of the private branch exchange in popularity among minicomputer users, particularly among defense contractors. This may mean the Defense Department will have a standard-setting influence on this area of data communication.

The Defense Department-dictated Ada language is being used at only 1.7% of all respondent sites, but at 4.3% of DEC sites and 5.2% of defense-oriented sites. By the end of next year, however, those numbers will have grown to 6.6%, 15.9%, and 25%, respectively.

The most popular machine to be acquired by respondents in the coming 18 months should be the DEC VAX 11/750, which is in the purchasing plans of 181 sites.

The AI language Lisp was found to be in use at only 3.7% of all sites, 9.9% of DEC sites, and 19.6% of education sites; by the end of 1985 those numbers are expected to have changed to 6.3%, 15.6%, and 28.2%, respectively.

The fault-tolerant computing market, pioneered by Tandem Computers and now targeted by many recently started companies, is still drawing fairly high interest from users, but that's topping off, Cowen contends. For instance, almost 40% of the respondents said they would *not* be interested in fault-tolerant systems even if compatible with their current minicomputers; 11% said yes to the same question. This suggests a much narrower market potential than might otherwise appear for new proprietary fault-tolerant systems suppliers.

In the "raw" microcomputer chip arena, where IBM has established itself as a de facto standard, Intel not surprisingly was found to be the leading supplier. Intel, of course, supplies the 8088 and 80286 chips to IBM and many other pc makers. In terms of unit purchases of individual chips, Intel supplied 40% through June 1984, followed by Motorola supplying 19%. As for the following 18 months, Intel is slated to get 47% of the respondent purchases, with Motorola obtaining a 24% share. In both cases, the runners-up were Zilog, RCA, General Instrument, and Rockwell. The 8088, which forms the heart of the IBM PC and its software-compatible clones, accounted for just over 30% of the Intel micro chips respondents will buy through the end of next year; the 8086 has an 18% to 19% share. According to survey results, Motorola should see an ongoing shift by users to its new 68010 and 68020 chips from the 68000. ◉

To order the complete 1984-85 Mini-Micro Survey results for $795, please call Cora Zaboly at (212) 605-9593.

Current users of this technology are early leaders in an area that still offers somewhat limited capabilities.

BUSINESS GRAPHICS TRENDS

by John A. Lehman, Doug Vogel, and Gary Dickson

Computer graphics is forecast as one of the fastest growing areas within the computer industry. Sales of graphics equipment are increasing, national graphics conferences such as ACM's SIGGRAPH and the National Computer Graphics Association's annual meeting are attracting record crowds, and industry pundits are predicting that future computer systems will be graphics-based. The use of computer graphics for managerial communication and analysis, what we shall call "business graphics," is predicted to be one of the major growth areas.

In spite of the outpouring of enthusiasm for computer graphics in general and business graphics in particular, we have little empirical evidence as to how organizations are using business graphics, what they are using them for, and how they anticipate using them. We have initiated a large-scale project, the Minnesota Management Graphics Project, to conduct research in these areas. This article reports the results of a survey that we recently completed to help answer these questions. The survey was intended to ascertain which members of the responding organizations are using business graphics, what they are doing with them, and how they have managed the process.

Our survey had 36 questions. It was pretested on a sample of Twin Cities companies, revised, pretested on a different group of companies, and revised again before being sent out. None of the original respondents were included in the final mailing (although some of the same organizations were represented).

The survey was sent to the dp managers of 789 organizations around the United States. All were members either of the Society for Information Management, Chicago, or affiliates of the Center for the Study of Data Processing at Washington University, St. Louis. The organizations we sent questionnaires to were selected by eliminating individual members, academic institutions, consultants, and other noninstitutional users from the lists. We had a 25% response rate; just under 200 questionnaires were completed and returned.

The respondents were predominantly managers (32%), directors (30%), and vice presidents (14%) from MIS/IS, representing corporate headquarters (64%) as opposed to divisions (34%). Most of the responses came from manufacturing organizations (42%), followed by financial services organizations (14%), retailing (6%), and utilities (6%); other services including engineering, transportation, government, education, and communication each made up 5% or less. The responding organizations ranged in size from eight to 200,000, with an average of about 11,000 employees. Full-time employees in the MIS/dp area ranged from zero to 15,000, with an average of about 440.

We identified nine trends that involve:

- technological capabilities
- motivation for use
- functional area use
- end users
- applications profiles
- organizational responsibilities
- user satisfaction
- impediments to increased use
- forecasts for the future

These trends can be divided into four major categories:

- existing situation
- user satisfaction
- impediments to increased use
- the future

The existing situation trends reveal where the respondent organizations stand with respect to technological capability, motivation for use of business graphics, functional areas using business graphics, end-user characteristics, business graphics applications, and responsibility within the organization for computer graphics.

90% HAVE COMPUTER GRAPHICS

Technological capability. The respondent organizations have a strong technical computer capability. Almost 90% of the respondents already have computer graphics capability as well as high levels of other advanced technologies such as databases, interactive debugging, telecommunication, very high level languages, and extensive use of microcomputers. The only technical area in which less than half of the repondents are involved is the ability to link microcomputers to mainframes (other than as dumb terminals).

While most of the respondents have business graphics facilities, almost a third of them have had these facilities for a year or less. Well under half of the respondents have had business graphics facilities for three or more years.

Investment in existing business graphics hardware and software capability is small relative to the size of the organizations and spread over a wide variety of vendors. SAS/GRAPH, from the SAS Institute Inc., Cary, N.C., is the most widely available mainframe package, and Lotus 1-2-3, by Lotus Development Corp., Cambridge, Mass., dominates among the packages that run on microcomputers (Figs. 1 and 2). Personal computers with graphic displays outnumber other graphic devices available in organizations. Respondents generally noted that the few existing graphics workstations were distributed throughout the organization.

Motivation for use. User demand was the major factor influencing the decision to buy computer graphics, followed by a desire to explore use of the technology (Fig. 3). Vendors offering graphics technology at a good price and/or with good support were almost never the major influential factor. Top management was only occasionally the first to voice a need for computer graphics. Graphic arts areas were almost never the first to voice a need.

Functional area use. In most responding organizations, only information systems, finance, and marketing are regular, heavy users of computer graphics. Personnel, operations research/management science, and production are notedly weak users (Figs. 4 and 5). Few functional areas are using graphics simply on a trial basis. Of those that are, information systems, marketing, and accounting predominate, while strategic planning, production, and operations research/management science exhibit little trial use.

End users. Very few end users have business graphics experience. Those who do are generally professionals or managers. In many of the organizations, almost no

FIG. 1

COMPUTER GRAPHICS SOFTWARE AVAILABILITY

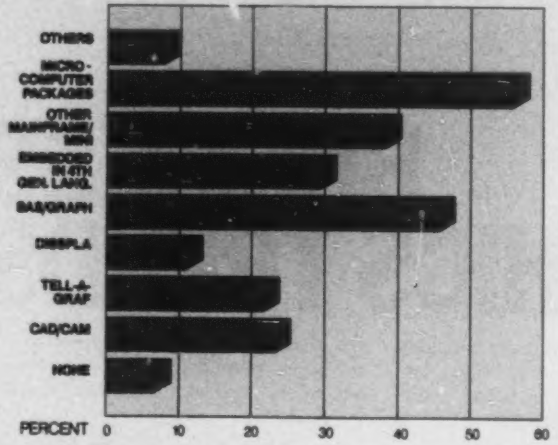


FIG. 2

MICROCOMPUTER SOFTWARE PACKAGES

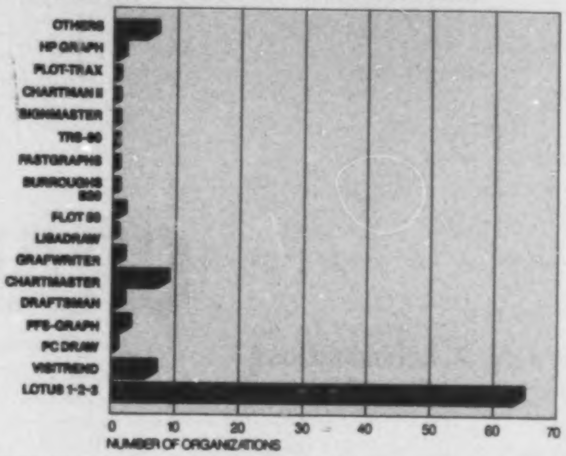


FIG. 3

MAJOR FACTORS INFLUENCING PURCHASE OF GRAPHICS TECHNOLOGY

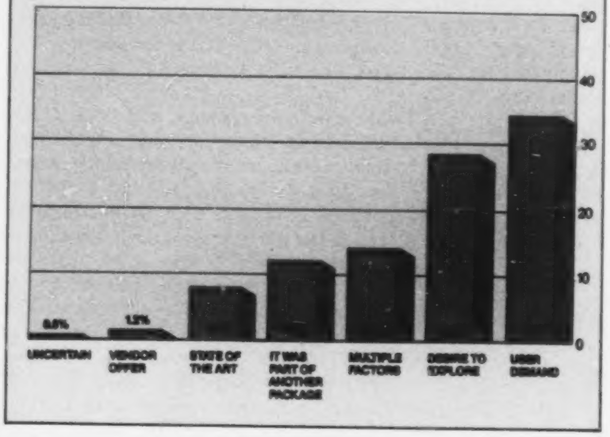


FIG. 4

FIRST IN ORGANIZATION TO VOICE NEED FOR COMPUTER GRAPHICS

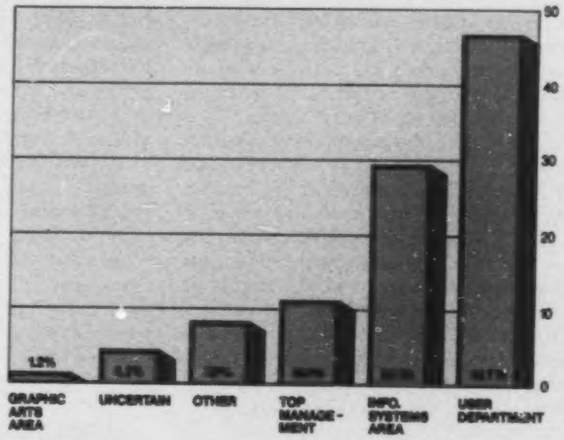


FIG. 5

FUNCTIONAL AREAS USING COMPUTER GRAPHICS

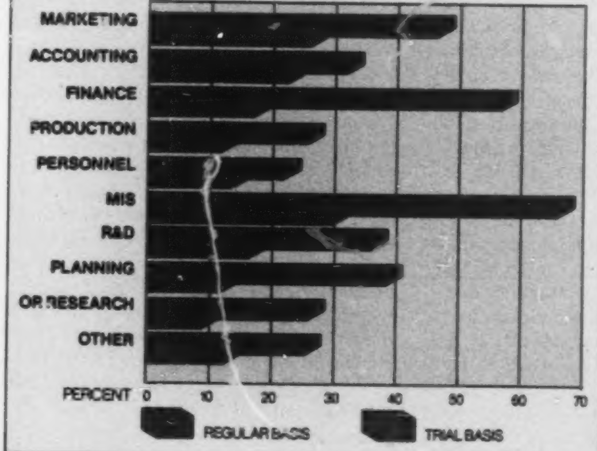


FIG. 6

PERCENT OF INFORMATION SYSTEMS USERS WITH COMPUTER GRAPHICS EXPERIENCE

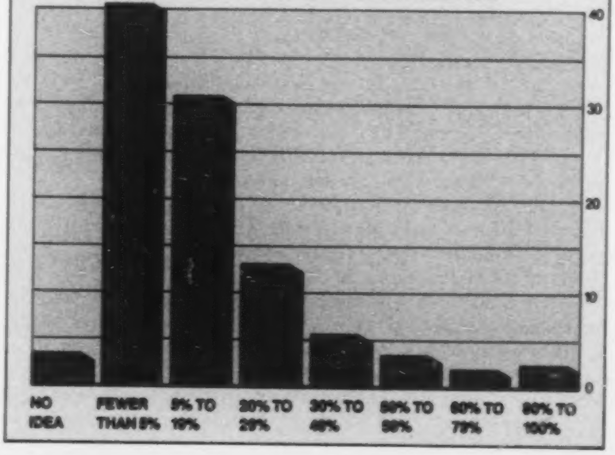


FIG. 7

USE OF GRAPHICS AS A DECISION SUPPORT TOOL

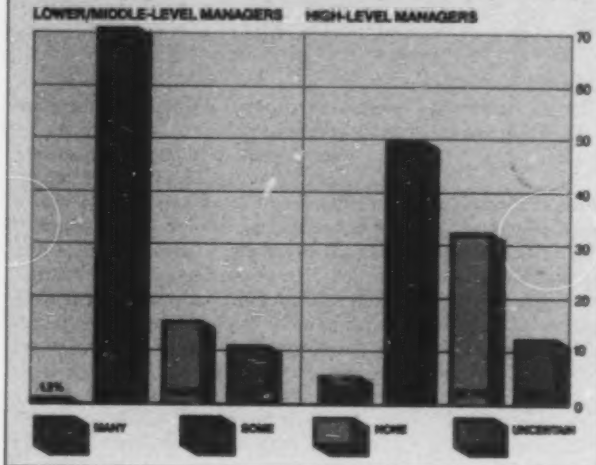


FIG. 8

SUPPORT FOR BUSINESS GRAPHICS

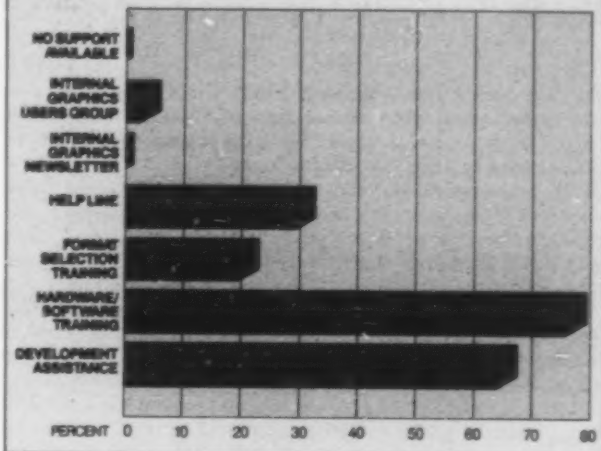


FIG. 9

USER SATISFACTION

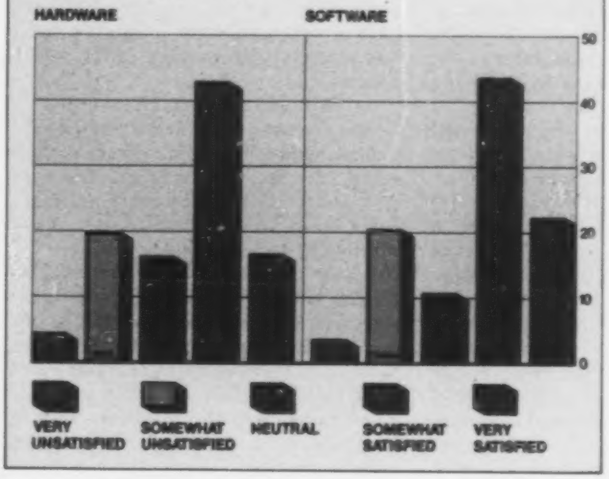


FIG. 10

IMPEDIMENTS TO INCREASED COMPUTER GRAPHICS USE

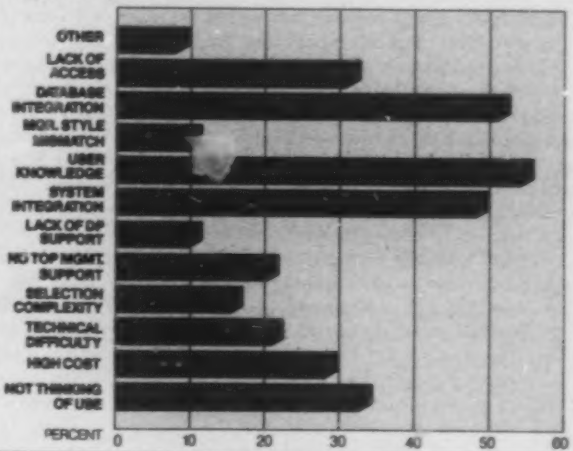


FIG. 11

ANTICIPATED GROWTH OF COMPUTER GRAPHICS FOR BUSINESS APPLICATIONS

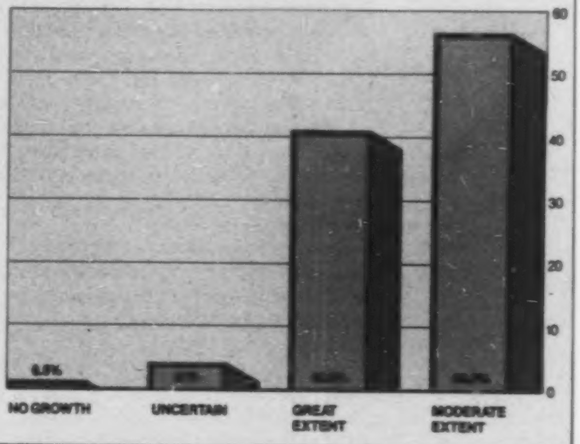
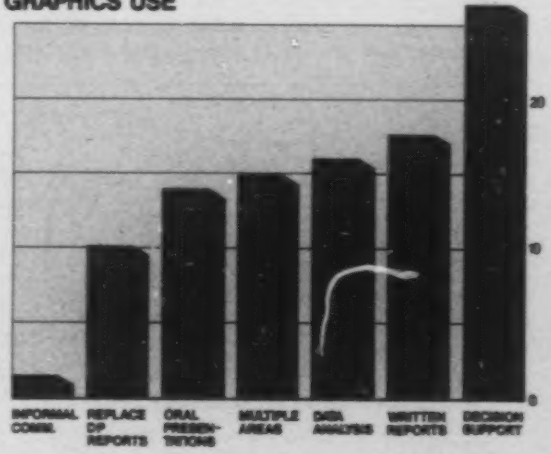


FIG. 12

MAJOR GROWTH AREA OF COMPUTER GRAPHICS USE



The movement of graphics into organizations is like a series of waves. The first has already crashed on the beach.

end users have business graphics experience; organizations where half or more of the end users have such experience are a small minority (Fig. 6). Professionals (34%), managers (23%), and managerial assistants (21%) generally interact with graphics software to develop or print charts and graphs. Executives (9%) generally do not.

Applications profile. In a rank ordering of computer graphics applications, support for written reports and oral presentations slightly outrank data analysis and decision support. Replacing or supplementing standard dp reports and informal communication of ideas rank lowest. Some low- and middle-level managers are using graphics for decision support, but only a handful of high-level managers are doing so (Fig. 7).

Organizational responsibility. Responsibility for computer graphics within the organization resides primarily in the MIS/dp and information center areas (quite often in both). Some of the respondents reported that formal responsibility for computer graphics has not been specified. In a bare majority of the organizations, no support staff is dedicated to computer graphics. Development assistance and training on the specifics of using graphics hardware and software are often provided. Relatively few organizations provide training on the art of selecting and designing charts and even fewer have internal newsletters or user groups (Fig. 8).

User satisfaction. User satisfaction is similar for graphics hardware and software (Fig. 9). In both cases, just under half the users are somewhat satisfied and about a quarter are somewhat dissatisfied. More users of graphics hardware are neutral than are software users. Only a few are very dissatisfied with either hardware or software; about a fifth of the users are very satisfied with both hardware and software. Differences as a result of years of business graphics experience, availability of dedicated support staff, and degree of training and assistance remain to be examined.

USER KNOW-HOW LACKING

Impediments to increased use. Most responding organizations cited insufficient user knowledge and poor integration of computer graphics with databases and other systems as impediments to increased use of computer graphics as a decision-support tool. Roughly one third of the respondent organizations noted that people just don't think of using computer graphics, and that sufficient access to computer graphics was lacking. Fewer organizations noted technical difficulties or lack of top management support as impediments, and even less felt there was a lack of support for computer graphics by the dp area or that computer graphics were inconsistent with managerial style (Fig. 10). Forced to select the major impediment, organizations responses were in about the same order as above.

The future. Most respondents felt that use of computer graphics will increase to a moderate extent and almost half expect it will increase to a great extent (Fig. 11) over the next three years. Three quarters of the organizations expected increases in computer graphics use for decision support, support of written reports, data analysis, and support of oral presentation. Most also foresaw an increase in its use to replace or supplement standard dp reports. A substantial minority expected increased use of computer graphics for informal communication of ideas (Fig. 12). Again, when asked to select the major area of growth in use of computer graphics over the next three years, organizations responded in the same order as above.

Half of the organizations are considering expanded use of business graphics as part of the formal information systems planning process. Only a few (12%), however, have a formal written plan for computer graphics.

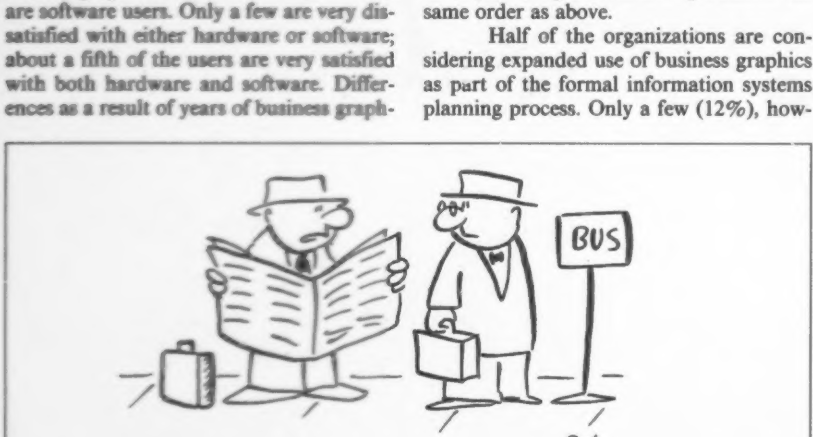
Responses to a query concerning what computer graphics features would contribute most to effective future use of the technology were dominated by pleas for integration capability with databases and systems. Ease of use and lower cost, particularly of hardcopy output devices, were noted, as were flexibility and better terminal resolution. Only 2% of the suggestions address graphics standards, which indicates that business users of computer graphics are much less concerned about this issue than the traditional graphics community.

The movement of business graphics into organizations is somewhat like a series of waves. The first has already crashed on the beach. Organizations are increasingly involved in business graphics. The next wave is swelling around integrating business graphics with existing databases and systems.

Still out in the ocean waiting to form is the wave that will introduce a substantial number of organizational personnel to business graphics. Present users are early leaders in areas where existing, somewhat limited capabilities can be used effectively.

As the next step in this research, we shall be carrying out an in-depth follow-up survey to learn more about organizations that heavily use management graphics. In particular, we want to learn more about what specific attributes of business graphics are being used, what attributes relate to successful use, and how present graphics systems should be changed to better accommodate both technical and human factors perspectives.

The results of this inquiry will give direction to forthcoming experimental and field research that is part of the Minnesota Management Graphics Project. These studies are intended to provide prescriptive knowledge about which graphical techniques are best suited for which applications. The series of studies will be coordinated and will use a limited set of dependent variables so that cumulative results can be produced from the individual experiments. ◉



"Dr. Gumer printed my letter, and he referred me to another advice column."

John A. Lehman, assistant professor of MIS, and Gary Dickson, professor of MIS, are both employed at the University of Minnesota's Department of Management Sciences. Doug Vogel is a PhD student at the university. All three are involved in the Minnesota Management Graphics Project, which began in 1983 and will continue for another four or five years.

CARTOON BY REX F. MAY

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DATAMATION 84

SYSTEMS SOFTWARE SURVEY

DO MERGERS MANGLE DATABASES?

DECENTRALIZING SECURITY

DATAMATION

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FEATURES

24
IN FOCUS

When it comes to poor old MIS, acquisitive corporations are "Getting Away With Merger," claim Laton McCartney and Joe Kelly.

68
THE INTEGRATED SERVICES DIGITAL NETWORK

William Stallings

What do you get when you combine value-added networking, long-haul telecom, sophisticated switches, and practical standards? A wired world—and it'll be here sooner than you might think.

84
SYSTEMS SOFTWARE SURVEY: USERS' FAVORITE DISKS

Data Decisions

More than 5,000 users give an average overall thumbs-up rating on 135 packages for the second year in a row.

143
GOAL 'N' IMPLEMENTATION 4-EVER

Nicholas Zvegintzov

Advice for the maintenance-lorn.

147
DECENTRALIZING DATA SECURITY

Gordon L. Reid

Effective security cannot be bought. It must be a state or mind that is adopted and accepted at all levels of the corporation.

NEWS IN PERSPECTIVE

36 **MICROSOFTWARE**
Vendor outlook bleak.

40 **SECURITY**
Speaking in codes.

45 **SUPERCOMPUTERS**
High stakes at NSF.

52 **NETWORKS**
Britain builds big.

61 **DATABASE SYSTEMS**
Up from the ashes.

64 **BENCHMARKS**

DEPARTMENTS

9 **LOOK AHEAD**
15 **LETTERS**
21 **EDITORIAL**

153 **PEOPLE**
159 **HARDWARE**
165 **SOFTWARE**
171 **SOURCE DATA**
176 **ON THE JOB**
177 **MARKETPLACE**
181 **READERS' FORUM**
184 **ADVERTISERS' INDEX**

INTERNATIONAL 152-1

-5 **HANGING ON THE EFT EDGE**
-15 **BANKING ON VIDEOTEX**
-24 **THE FRENCH FACTOR**

COVER PHOTOGRAPH BY WALTER WICK
MEDIA COURTESY OF DEC

More than 5,000 active users rate the performances of 135 packages.

SYSTEMS SOFTWARE SURVEY: USERS' FAVORITE DISKS

by Data Decisions

Ever wonder if other data processing managers have the same trials and tribulations with their systems software as you do? Glitches in communications code, program development aids that are more trouble than they're worth, or resource managers that consistently miss the estimating mark do exist, but the latest version of DATAMATION's annual systems software user survey shows that on balance, life is not getting any worse when it comes to systems software maintenance. On an ascending scale of 1 to 10, the average overall performance rating was a rather positive 7.1 for the second year in a row. No wonder the software business is growing at a 35% annual clip from a $9 billion base this year, with DBMS and productivity aids on the shopping lists of dp managers around the world.

To find out just what kind of experiences information processing professionals were having with the most widely used systems software products over the past year, DATAMATION and Data Decisions, a Cherry Hill, N.J., computer research firm, polled thousands of users on what they think of their recently purchased systems software—how they feel about vendor support, package performance, and whether the package was going to be replaced.

This year 5,415 active users of 135 widely used systems software packages for mainframes and minis responded with ratings and comments on their recent purchases. Using their ratings, we came up with the average rating in five experience categories for each product, and comparisons by nine product groupings. While the average rating of 7.1 is the same as last year, that number masks some important changes in the individual product rankings.

The highest rated package was in the utilities/operating systems/enhancements group—Flee/Xp from Goal Systems Int'l., Columbus, Ohio, took top honors with an average rating of 9.1. In addition, 89% of the respondents classified it as "an outstanding value." Call it the Mary Lou Retton of the software set. This is the first time in many years of surveying users that a package has won such acclaim. However, it's not entirely fair to call it the best software package on the market because its function is not as complex as that of a database management system or an artificial intelligence package. But it does show that a real rave review is possible in the software business.

The highest average rating received by any one category was 7.7, for utilities/operating systems/enhancements, and the lowest was 6.6, for data center management systems.

As for database management systems, System 1022 from Software House, Cambridge, Mass., led all DBMS packages with an average rating of 8.4, but Software AG's ADABAS and Cullinet's IDMS received average ratings of 8.0 and 7.9, respectively, making them the highest rated of the IBM-based systems in the survey.

In the data management and DBMS aids category, Quickjob III from System Support Software, Dayton, Ohio, came in first with a rating of 8.4. Condor from Phoenix Computer, Culver City, Calif., headed up the list of program development aids with an 8.4 average rating, but it was closely followed by Mapper from Sperry, with a rating of 8.2.

In the media control and resource management category Super MSI from CGA Products, Holmdel, N.J., was the top package, with an 8.3 rating.

There was a tie for top honors in the monitor and performance aids category between Candle Corp.'s OMEGAMON and Morino Associates' MICS, both with aver-

PHOTOGRAPH BY WALTER WICK

The highest-rated package was in the utilities/operating systems/enhancements group.

age ratings of 8.3.

A relative newcomer to the survey, Haverly System's OMNI, took top honors in the query and report writer category, with an average rating of 8.2. There was another tie in the data center management category, between UCCEL's UCC-7 and Value Computing's Data Center Management System: each had a 7.3 average rating.

A perennial winner again took top place in the communications category. WESTI from Westinghouse, with a rating of 7.9, led all other packages in that group. Altergo's SHADOW II, however, came in a close second with a rating of 7.8.

SOME CAVEATS IN ORDER

A few caveats are in order here. The classifications are not exact, and in some cases the nine categories include products that are not direct competitors. Also, newer systems, with more up-to-date technology, are typically rated significantly higher than many of the more mature offerings. One noticeable exception is WESTI, a decidedly mature product that still leads the field in the area of communications. One reason for this may be that the complexity of communications technology in general might make users overly critical of products offering new methodologies and allow a less complex terminal management product to shine.

Uniformly rave reviews are not always the case. Although the average package received an overall rating of superior (a 9 or a 10 score) from 26% of its users, a very good rating (6, 7, or 8) from the majority, an acceptable rating (3, 4, or 5) from 18%, and an inadequate (1 or 2) rating from 2%, still, 13%, or approximately 650 users, indicated that they were actively seeking replacements. About one third of this group, or 200 users, said they were shopping because their current packages lacked the features and capabilities they felt they needed. Only 2% were doing so because of general dissatisfaction, however—a remarkably low figure.

Users were also asked detailed questions about vendor support, system performance, and features. Ease of use, freedom from bugs, and installation time are included in the performance evaluations. Overall, users were slightly less pleased with vendor support than they were with the packages themselves and gave support an average rating of 6.4. The high and low scores in this area—7.0 and 5.9 respectively—were registered by the same two types of packages: utilities and data center management.

Seventy-eight percent of this year's respondents are running their products on IBM mainframes. When we add the 4% running on Amdahl systems, the 2% on NAS, and the 1% on Magnuson, this brings the IBM-compatible base to 85%, which closely approximates the estimated IBM share of the market. As to the rest, 5% were using DEC minicomputers and mainframes, 3% were Sperry users, 2% had Hewlett-Packard systems, and 1% used Wang small systems. The remaining 5% reported using a variety of computers—among them CDC, Honeywell, Prime, and Data General systems.

We asked the users to review performance using four measurable parameters: efficiency of hardware utilization, ease of use, freedom from bugs, and the time it took to install the package. Vendor support included responsiveness to requests, training, and documentation. When rating operational characteristics, the user was asked to measure the product's ability to handle expanded processing volumes, the availability of effective security measures (when applicable), and the effectiveness of its backup and recovery procedures (again, when applicable).

A quarter of the packages in this year's survey didn't receive ratings in the areas of backup and recovery and security. Although some packages don't require these provisions, many that deal with transaction processing must contain them. Because of this, we have broken out the composites for these two functions, and have indicated how many packages were rated on these points.

SECURITY AN ISSUE FOR DBMS

Probably because DBMS and communications software are the most complex and sophisticated entities surveyed, the users were much more demanding with regard to backup and recovery, and especially with regard to security.

Notice that program development aids are consistently near the top of the ratings for backup, recovery, and security, due probably to their background. They are generally fourth generation languages and application development tools and quickly evolved as the computer industry took off on its microcomputer-based interactive personal computing binge. Although they weren't necessarily brought about by the introduction of the microcomputer, the technology was greatly influenced by it. As the trend toward higher-level languages that let the end user "program" without making demands on the always busy dp department continues, the popularity of these tools will continue to increase.

Monitoring and performance aids is another new area that bears watching. This category also received relatively high performance ratings.

While program development aids are designed to ensure the best utilization of human resources, monitoring and performance aids concentrate on providing the hardware/software combinations that utilize the computer best. Developing these products calls for considerable expertise, much more than required for a utility package. The cost of this expertise is frequently reflected in the cost of the package, and this goes a long way toward discouraging smaller installations. The size of the marketplace may be part of the reason there are so few vendors of these types of packages.

How good or bad a product is in the view of users often depends on how well it is supported. When it comes to the mainframe software market, it is rare for a vendor not to supply some form of support. Four basic types of support are typical: onsite, where the representative of the vendor is either constantly on location or very close by; on-line, where there is a communication line between the customer's computer and the maintenance site so that the problem can be downloaded; mail, where the user mails a series of dumps to the vendor for analysis and resolution; and telephone hot line, which allows the customer to pick up a phone when a problem arises and discuss it immediately with a specialist at the vendor's site. Some hot lines are manned 24 hours a day, seven days a week, while others are available only at set times.

It came as no surprise that 90% of all respondents to this year's survey reported the telephone hot line as the prime form of support used within their installations. On a scale of one to 10, these respondents rated the service at 6.7—higher than any other form of service. How else can a vendor make so much expertise available to so many installations on a real-time basis? What was somewhat surprising was the fact that 51% of the respondents said they were still using the mails for vendor support. And on top of that, they rated this support at 6.1. The only possible explanation for this high percentage is that many of the computer vendors (e.g., IBM) require that problems be documented and mailed in with dumps even when a temporary fix has been worked out by phone. It is also possible that, rather than tying up the telephone lines trying to reproduce nonrecurring problems requiring low-priority attention, users are handling this type of situation by mail. In either case, we can expect mail support to continue until on-line support becomes financially feasible.

On-line support was introduced about 10 years ago but never really got off

Program development aids were consistently near the top of the ratings for backup, recovery, and security.

the ground because the associated resources and costs made it practical for only a few installations. Very few vendors are offering on-line support and only a handful of respondents reported using it. Those who do rated it a low 5.8. Despite this, there's a strong possibility that, as more sophisticated communications facilities become available, the use of on-line facilities to help correct software problems will become feasible. We estimate, however, that it will be at least 10 years before this happens.

This leaves telephone support, offering a centralized pool of expertise. In spite of everything, 39% of the users of 87 packages reported that on-site support was their prime source of support, and they rated it a healthy 6.5. Most of the products supported on-site were large and complex.

SEVEN BUYING FACTORS

Taking all the different factors into consideration, how do buyers decide what to purchase? In this year's survey seven basic factors were suggested, and respondents indicated the level of influence each had on their decisions to acquire the software being rated. Seventy-nine percent reported the major factors influencing their decisions were package features and capabilities; 62% stated compatibility with other software in use was a major consideration; and 63% said productivity and ease of use were of major concern.

Recommendations from consultants had the least influence, with 63% of all respondents reporting they had absolutely no influence on their decision to purchase. In another interesting finding, 51% reported that experience with another product from the same vendor also had no direct influence. This means that a vendor can no longer assume that a user will automatically acquire another package just because the first one worked well.

While features and capabilities were the prime factors influencing the purchase of packages in general, they were of primary concern for only 67% of the users of communications packages. Seventy percent of this group was more concerned with product compatibility. Until some truly acceptable standards are adopted, incompatibility will continue to be a major concern facing all those who implement any form of communications.

Fifty-six percent of all respondents reported they had evaluated other packages before acquiring their product; 29% of this group evaluated an average of 1.4 packages from their computer vendor, but 18% indicated that their computer vendor did not offer an equivalent. Forty-five percent indicated they looked at an average of 2.4 packages from independent suppliers.

The fact that almost twice as many respondents went to independent suppliers and that almost twice as many packages from independents were reviewed is to be expected. The majority of the products in this survey are designed to operate on large IBM mainframes, and this is the market area where independents feel there is the greatest room for competition. As we have seen, the manufacturer frequently doesn't even have an equivalent product, and even Big Blue is limited in the number of alternatives it makes available for one specific configuration. On the other hand, there may be eight or 10 independents addressing that one area.

In reviewing each of the nine categories, we found that purchasers of media control and resource management packages and DBMSs were most likely to look at evaluation alternatives; 792 users responded to this question, and 61% in each of the categories said they had examined other packages. Thirty-three percent of the DBMS users reported evaluating an average of 1.5 packages from computer vendors, and 54% of both groups noted looking at an average of 3.3 packages from independents. With the introduction of the new IBM DB2 product, we can expect more respondents to look at computer vendor software products in the future.

Users of monitoring and performance aids seemed to spend the least effort evaluating comparable products. Still, 49% of the 504 respondents to this question indicated that some effort was made; 23% looked at an average of 1.2 packages from the computer vendor, and 39% investigated an average of 1.8 packages from independents. One reason for this comparative lack of activity might be a lack of alternative products. In fact, in some cases products from the computer vendors are the only offerings.

FUTURE OF VENDOR PRODUCTS

What about the future of these products? Only 19% of all our respondents reported doing any postacquisition evaluation; 8% evaluated alternate packages from their computer vendor and 12% evaluated packages from independent suppliers. Surprisingly, the DBMS purchasers were the most active in this ex post facto exercise: 26% of the 792 DBMS respondents said they had evaluated another product. Of this group, 49% looked at an average of 1.7 packages from their computer vendor, and 66% indicated they had investigated an average of 2.8 packages from independents.

Considering the cost involved in purchasing and installing a DBMS, it seems unlikely that any quick changeover would be considered. Much of this postacquisition activity, however, may be related to upgrading (e.g., looking at SQL or DB2 to supplement DL/1 or IMS). In addition, large corporations might be looking to expand their database capabilities without necessarily replacing anything.

The data center management packages were subject to the least postacquisition evaluation (by only 13% of the 332 respondents). Of those, 10% reviewed on average less than one package from computer vendors, but 49% looked at an average of 1.2 packages from independents. Here is another case where the number of packages available is far fewer than in many other categories and the installation effort is great. Therefore, users probably won't start looking for a replacement soon.

How many respondents were actively looking to replace their packages? Of the total group, 13%, or about 650 users, said they were actively evaluating alternatives. Leading the field were users of communication packages and DBMSs, with 19% out of their total respondent bases of 387 and 792 respectively.

It comes as no surprise that users of communications software are now looking elsewhere, especially in the area of CICS-competitive products. Many independent suppliers of CICS-type monitors have been dropping out of the market. The latest dropout is Applied Data Research's DATACOM/DC. This development, plus TSI International's halt in the marketing of TASK/MASTER and the dropping of MINICOMM from the SDA/Polygon line, reinforces the view that major TP monitor vendors are leaving the field to IBM and CICS.

One exception to this is Westinghouse's WESTI. This small-system, limited-facility monitor gives good value for the money, has kept in tune with the latest technology without promising the user the world, and is marketed on a very low-profile basis.

In the area of communications in general, 22% of the respondents indicated they were seeking to replace products that didn't have features and facilities they felt they needed; 25% claimed their products performed too slowly, and 15% were generally dissatisfied. Interestingly, 15% reported that they were seeking alternative products because they were upgrading from one operating system to another from the same vendor. This probably means that many IBM users are upgrading from a DOS to an OS environment.

Of the 123 respondents who were

Package features and capabilities were the major factors that influenced 79% of buying decisions.

actively seeking a replacement for their DBMSs, 36% reported they required features and facilities that did not exist in their current system, 27% said they were generally dissatisfied with their system, and 25% cited slow performance as the major reason for seeking an alternative.

Owners of data center management packages were the least anxious to replace their systems (only 7% of the 332 respondents felt this way). Of these, 23% reported general dissatisfaction as the major reason for refraining from replacement, 21% complained of poor or discounted vendor support, 20% wanted additional features and capabilities, and 14% felt the price/performance ratio was unsatisfactory.

PRODUCT MEASURED BY VALUE

Products can be measured in many ways, but the one true measure of a good software acquisition is whether or not users feel they have gotten true value for the money invested. In order to judge this, we asked our survey respondents to characterize their acquisitions as excellent, good, or poor values.

For a product to be considered an excellent value, it must supply outstanding features and capabilities at a price comparable to or lower than competitive packages or provide good (not necessarily outstanding) features and capabilities at a price substantially below competitive packages. To be considered of good value, a product must provide outstanding features and capabilities at a higher price than competitive packages with lesser capabilities, provide good but not necessarily outstanding features and capabilities at a price comparable to competitive packages, or provide newer features and capabilities than competitive packages but at a significantly lower price.

A poor value is a package that provides good but not outstanding features and capabilities, but at a price significantly higher than competitive packages, or one that lacks many important features and capabilities but is priced comparable to or higher than competitive packages.

The results showed that 46% of the users felt they had acquired excellent value, while 44% said that they received good value. Only 4% felt they had made poor selections. Not unexpectedly, 61% of those who reported on utility-type packages considered them excellent values, while only 43% of the users of communications packages and 40% of the DBMS purchasers felt the same way—and 7% and 8% respectively felt they had received poor value. Only 31% of those judging data center management packages and 38% of those with query and report writing systems rated their acquisitions as excellent value.

One area that is always of interest is whether the products exceeded, met, or failed to meet the vendor's promises concerning installation time, features and capabilities, and performance/speed/efficiency. The average systems software package studied did best in the area of features and capabilities, with 91% of the users saying their acquisitions met or exceeded the vendor's promises. In addition, 89% said they met or exceeded promises about installation time, and 88% reported that promises relating to performance/speed/efficiency were met or exceeded.

Eighty-one percent of the users of the average systems package said that it met or exceeded vendor promises in all three areas, and only 1% said it hadn't met any vendor promises. Of the nine package groups, utilities/operating systems/enhancement packages were rated most favorably, with 88% of the users reporting that all vendor promises had been met or exceeded. Data center management packages fared worst, with only 72% making this claim.

In order to participate in Data Decisions' survey, the user must have had the package installed for at least six months. The average package was, in fact, installed for 38 months, with communications packages installed for the longest period, 50 months, and program development aids and media control and resource management packages installed for the shortest time, 34 months.

BAR GRAPHS HEART OF REPORT

The heart of this report is a series of bar graphs that show certain ratings for each product, each individual category, and the survey as a whole. In this section, which begins with surveywide averages, the graphs are laid out by category, with each set of product graphs preceded by a graph with the averages for that category.

The graph for the whole category has one set of red bars that shows the various averages. The product graphs have two bars per rating, a red bar showing the average for the category and a black bar showing the rating for the specific product.

Other information includes the number of responses per package or category, the number of users who judged the product outstanding, the number who judged vendor support outstanding, and the number actively seeking to replace the product and the reasons for this action. We also provide the vendor's name, address, and telephone number to facilitate further contact.

Rating Summaries

COMMUNICATIONS SOFTWARE—11 packages studied.

Mean Score
7.9—Westinghouse Electric WESTI
7.8—Altergo Products SHADOW II
7.5—Tone Corporation TONE 3/TONE 4
7.1—Applied Data Research ADR/ROSCOE
7.0—Digital Equipment DECnet
6.9—Group Average, IBM Corp. CICS/VS
6.6—Cincom Systems ENVIRON/1
6.5—Software AG COM-PLETE
6.4—IBM TSO
6.2—IBM ICCF
6.0—IBM IMS/DC

DATA CENTER MANAGEMENT SYSTEMS—7 packages studied.

Mean Score
7.3—UCCEL UCC-7, Value Computing Data Center Management System
7.1—UCCEL UCC-11
6.9—Pace KOMAND
6.7—Johnson Systems JARS
6.6—Group Average
5.5—Computer Associates CA-SCHEDULER
5.1—Value Computing COMPUT-A-CHARGE

DATA MANAGEMENT & DBMS AIDS—15 packages studied.

Mean Score
8.6—System Support Software QUIKJOB III
8.4—AS Institute SAS
8.0—Dylakor DYL-280
7.9—Battelle Labs BASIS
7.8—DBMS Inc. TOOL KIT
7.1—Dylakor DYL-260
7.0—Group Average
6.9—Applied Data Research DATA DICTIONARY, MSP DATAMANAGER
6.8—Oceanic EXTRACTO, Application Software ASI-ST
6.5—Information Processing BLISS/COBOL
6.4—Henco Software INFO
6.3—Sperry Corp. IMS
5.5—UCCEL UCC-10
5.1—TSI Int'l. DATA CATALOGUE 2

DATABASE MANAGEMENT SYSTEMS—21 packages studied.

Mean Score
8.4—Software House SYSTEM 1022
8.0—Software AG ADABAS, Cullinet IDMS
7.8—Hewlett-Packard IMAGE/3000
7.3—Information Builders FOCUS
7.2—Computer Corp. of America MODEL 204, Mathematica RAMIS II
7.1—Infodata INQUIRE, Honeywell DM-IV
6.9—Cincom Systems TIS
6.8—Group Average
6.7—Intel SYSTEM 2000, DEC DBMS, Sperry Corp. DMS-1100
6.5—Tominy Data Base Plus
6.3—National Information DPL

Users of monitoring and peformance aids spent the least effort evaluating comparable products.

6.2—Oracle Corp. ORACLE
6.0—IBM SQL/DS
5.8—Cincom TOTAL, IBM DL/1, IBM IMS/VS
5.6—Applied Data Research ADR/DATACOM/DB

MONITORING/PERFORMANCE AIDS SOFTWARE—13 packages studied.
Mean Score
8.3—Candle Corp. OMEGAMON, Morino Associates MICS
7.7—Candle Corp. DEXAN
7.5—Morino Associates TSO/MON
7.4—BGS Systems CAPTURE/MVS
7.3—Boole & Babbage RESOLVE
7.2—Applied Data Research ADR/LOOK
7.0—Group Average, BGS Systems BEST/1
6.8—Boole & Babbage CMF/MONITOR
6.4—Boole & Babbage IMF
6.0—Boole & Babbage TSA
5.7—Boole & Babbage PPE
5.4—Duquesne Systems QCM

PROGRAM DEVELOPMENT AIDS—17 packages studied.
Mean Score
8.4—Phoenix CONDOR
8.2—Sperry Corp. MAPPER
8.0—Applied Data Research ADR/ROLLIE
7.8—Online Software Int'l. INTERTEST
7.7—Cincom Systems MANTIS
7.6—Software AG NATURAL, IBM ISPF
7.3—Altergo Products QUOTA II
7.2—Pansophic Systems O-W-L
7.1—Online Business Systems WYLBUR
7.0—Group Average, Altergo Products CPG
6.6—TOM Software SPEED I
6.3—Applied Data Research METACOBOL
6.0—Management & Computer Services DATAMACS
5.8—Oxford Software UFO
5.4—Informatics MARK IV
4.6—IBM DMS

MEDIA & RESOURCE MANAGEMENT SOFTWARE—16 packages studied.
Mean Score
8.4—CGA Computer SUPER MSI
8.3—Cambridge Systems Group ACF2
8.1—CGA Computer MSM
8.0—Corodale SYSTEM/MANAGER
7.9—Sterling Software DMS/OS
7.8—SDI Inc. EPAT
7.7—Cambridge Systems Group ASM2, Computer Associates CA-DYNAM/FI
7.5—UCCEL USS-1
7.3—Group Average
7.2—Computer Associates CA-DYNAM/D
7.0—Tower Systems TFAST
6.9—Tower Systems DFAST
6.6—Pansophic Systems PANAUDIT
6.5—Computer Associates CA-TLMS
6.1—UCCEL UCC-3
5.7—Pansophic Systems PANEXEC

QUERY/REPORT WRITING SYSTEMS—11 packages studied.
Mean Score
8.2—Haverly Systems OMNI
7.3—Applied Data Research ADR/DATAQUERY, Cullinet EDP AUDITOR
7.2—Pansophic Systems EASYTRIEVE
7.1—Computer Associates CA-EARL
6.8—Group Average
6.7—TSI Int'l. AUDIT ANALYZER
6.6—H & M Systems KEYFAST

UNIX
TRAINING

Owners of data center management packages were least anxious to replace their systems.

6.4—Cullinet CULPRIT
6.3—DEC DATATRIEVE
6.2—HP QUERY/3000
5.9—TSI Int'l. DATA Analyzer

UTILITIES/OPERATING SYSTEM ENHANCEMENT SOFTWARE—
24 packages Studied.
Mean Score
9.1—Goal Systems FLEE/XP
8.8—Goal Systems FAVER/XP
8.7—Westinghouse Electric Disk Utility System
8.6—Macro 4 LOGOUT/MULTILOG, Software Pursuits DOS/MVT/VSE
8.5—Syncsort Inc SYNCSORT/DOS
8.4—Computer Associates CA-SORT
8.3—Innovation DP FAST/DUMP/RESTORE (FDR), Syncsort Inc. SYNCSORT/OS
8.2—SDI Inc. INSTANT FBA
8.1—Computer Associates CA-RAPS, Compuware ABEND-AID, Goal Systems FAQS/XP
7.8—CGA Computing TOP SECRET
7.7—Group Average
7.6—Applied Data Research LIBRARIAN
7.5—IMSL Inc. IMSL LIBRARIES
7.3—Pansophic Systems PANVALET
7.1—Century Analysis BOSS/3
7.0—TSI Int'l. KEY/MASTER
6.8—Computer Associates CA-DRIVER
6.7—Niadorf Computer Software EDOS
6.3—UCCEL UCC-2
5.8—Value Computing VALU-LIB
5.6—Computer Associates CA-JASPER ◉

This systems software survey is based on a forthcoming report in Data Decisions' *Software*, a monthly updated information service covering systems and application software for mainframes and minicomputers. Additional information on Data Decisions' subscription services and custom consulting capabilities is available from Data Decisions, 20 Brace Road, Cherry Hill, NJ 08034, (609) 429-7100.

METHODOLOGY

The survey was designed by Data Decisions and conducted by Beta Research Corp., Syosset, N.Y., in the spring and summer of 1984. The objective was to obtain users' evaluations of their packages and data on the environment in which systems software is used.

The universe consisted of packages designated by International Computer Programs, Indianapolis, as having generated $5 million or more in sales; 164 packages from 79 companies qualified for this year's survey. On May 18, a registered letter on DATAMATION stationary was sent to the vendor of each package listed in the ICP rankings, requesting a list of the 125 most recent customers who had the designated package installed and running for at least six months as of the date of the letter; for packages with fewer than 125 qualified customers, the vendor was asked to supply the entire user file. Vendors were also asked to certify that the lists represented their 125 most recent customers and that they would make no effort to contact these customers with regard to the survey. Users were also asked whether they had been contacted by the vendor.

A minimum of two follow-up phone calls was made to each vendor in an effort to gain maximum cooperation; 56 companies (71% of those contacted) responded, providing lists for 105 systems packages (63% of those originally identified for inclusion in the sample). Four of the package lists contained fewer than 29 names (the minimum mailing sample), and a database maintained by Computer Intelligence Corp., La Jolla, Calif., was used to supplement three of these lists. The fourth was dropped, leaving a net of 104 packages from 56 companies. Because packages from hardware vendors aren't listed by ICP, user lists were also obtained from the CIC database for 31 additional packages marketed by 12 major hardware manufacturers. With the addition of these lists, the total survey universe grew to 135 packages from 68 vendors.

During the first week of July 1984, 12,653 questionnaires were mailed to the individual designated as the vendor's primary contact at each location. In a cover letter, recipients were asked to give the questionnaire to someone who used the package if they were not personally qualified to respond. To encourage a timely response, a $1 in currency incentive was included in the first mailing. A second mailing, without an incentive, was made in early August to all nonrespondents.

A total of 5,971 questionnaires was returned, for a net response of 48%; 118 questionnaires were undeliverable by the postal service.

To increase the response rate, telephone interviews were conducted among nonrespondents. The sample was selected so as to provide a minimum response rate of 4% and a minimum user base of 15 for each package. The questionnaire used in the telephone interview was identical to that used in the mail survey.

The telephone interviews brought the total number of responses to 6,137, for an overall response rate of 49%; included in the responses were 722 indicating that the package was not currently in use at the installation. ◉

AV. TOLERANCES FOR 68% CONFIDENCE LEVEL

	OVERALL SATISFACTION			SPECIFIC ATTRIBUTE RATINGS			
SAMPLE SIZE	6.0 or Under	7.0	8.0 or Higher	5.0 or Under	6.0	7.0	8.0 or Higher
60 or more	.20	.20	.15	.30	.30	.25	.20
50 to 59	.25	.25	.20	.30	.30	.30	.25
40 to 49	.30	.30	.25	.35	.35	.30	.25
30 to 39	.35	.30	.25	.40	.40	.35	.30
20 to 29	.40	.30	.30	.45	.45	.45	.45
15 to 19	.50	.50	.40	.55	.55	.50	.45

As in all surveys, the numbers reported are estimates within a range of what would have been obtained if all sites in the universe had been surveyed. The margin of sampling variation, or "tolerance," applicable to the ratings in this survey are given in the above table.

The chances are approximately two out of three that a reported rating differs by no more than the indicated tolerance from the rating that would have been obtained if all eligible sites had been surveyed.

For example, suppose a sample of 30 sites gives a software package an overall satisfaction rating of 7.0. The table indicates a tolerance of 0.30, so the chances are two out of three that the interval 6.70 to 7.30 includes the rating that would have been obtained if all eligible sites had been surveyed.

Rating Values

10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

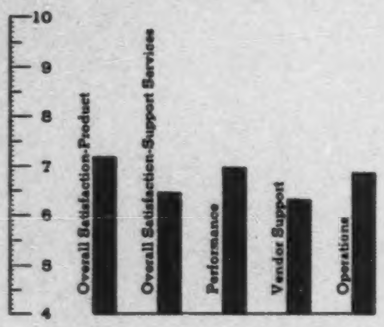
Legend

▬ Specific Product Rating
▬ Group Average Rating

■ OVERALL SUMMARY

Average—All Packages • 135 packages

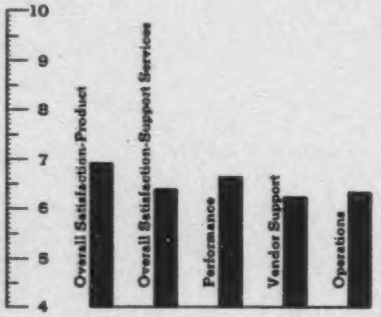
5415 responses • 26% judged package and 14% judged vendor outstanding • 704 actively seeking to replace package, with 108 citing unsatisfactory performance as reason.



□ COMMUNICATIONS

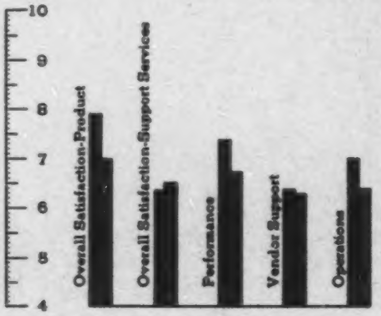
Group Average • 11 packages

387 responses • 20% judged package and 13% judged vendor outstanding • 74 actively seeking to replace package, with 12 citing unsatisfactory performance as reason.



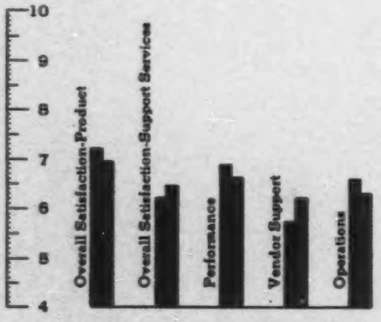
SHADOW II • Altergo Products, 400 West Cummings Park, Suite 6900, Woburn, MA 01801 • 617-983-8811

43 responses • 40% judged package and 9% judged vendor outstanding • 17 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



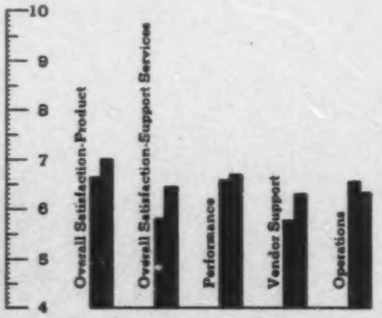
ADR/ROSCOE • Applied Data Research, Inc., Route 206 & Orchard Road, CN-8, Princeton, NJ 08540 • 201-874-9100

41 responses • 20% judged package and 12% judged vendor outstanding • 3 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



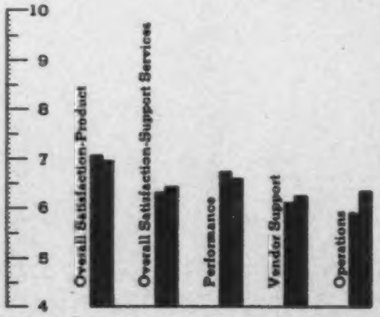
ENVIRON/1 • Cincom Systems, 2300 Montana Avenue, Cincinnati, OH 45211 • 513-662-2300

48 responses • 19% judged package and 6% judged vendor outstanding • 20 actively seeking to replace package, with 5 citing unsatisfactory performance as reason.



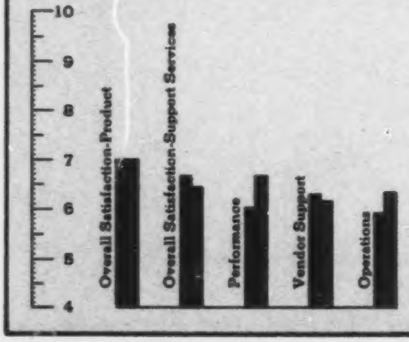
DECNET • Digital Equipment Corporation, 146 Main Street, Maynard, MA 01754 • 617-897-5111

31 responses • 32% judged package and 10% judged vendor outstanding • 1 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



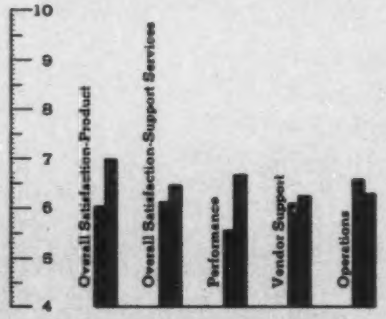
CICS • IBM Corporation, National Accounts Division, 1133 Westchester Avenue, White Plains, NY 10604 • 914-696-1900

36 responses • 17% judged package and 22% judged vendor outstanding • 0 actively seeking to replace package.



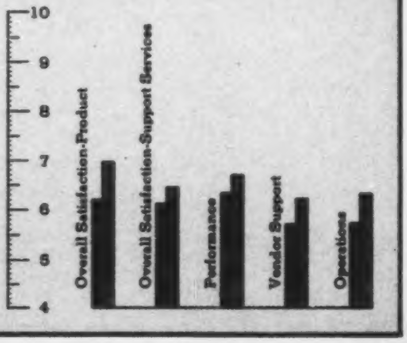
IMS/DC • IBM Corporation, National Accounts Division, 1133 Westchester Avenue, White Plains, NY 10604 • 914-696-1900

16 responses • 6% judged package and 6% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



ICCF • IBM Corporation, National Accounts Division, 1133 Westchester Avenue, White Plains, NY 10604 • 914-696-1900

35 responses • 3% judged package and 9% judged vendor outstanding • 10 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



Rating Values

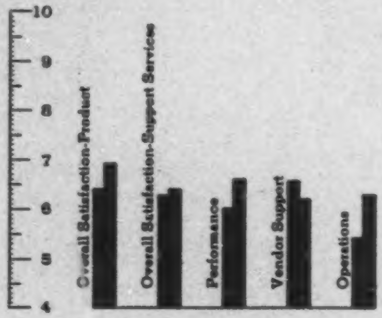
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▬ Group Average Rating

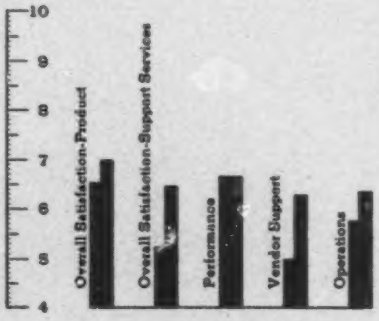
TSO • IBM Corporation, National Accounts Division, 1133 Westchester Avenue, White Plains, NY 10604 • 914-696-1900

31 responses • 7% judged package and 10% judged vendor outstanding • 1 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



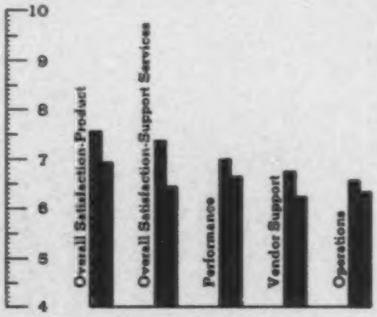
COM-PLETE • Software AG of North America, 11800 Sunrise Valley Drive, Reston, VA 22091 • 703-860-5050

56 responses • 11% judged package and 2% judged vendor outstanding • 11 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



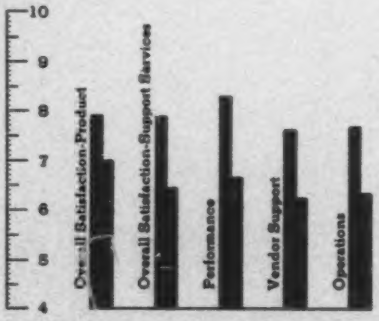
TONE 3/4 • Tone Corporation, 1735 South Brookhurst, Anaheim, CA 92804 • 714-991-9460

27 responses • 22% judged package and 26% judged vendor outstanding • 10 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



WESTI • Westinghouse Electric, 777 Penn Center, 7th Floor, Pittsburgh, PA 15235 • 412-636-3100

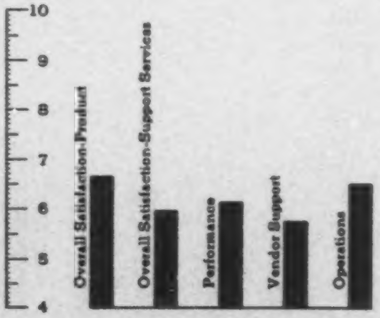
23 responses • 48% judged package and 35% judged vendor outstanding • 3 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



☐ DATA CENTER MANAGEMENT

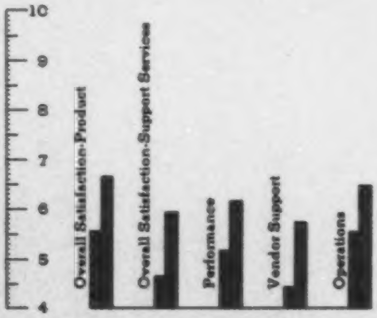
Group Average • 7 packages

332 responses • 13% judged package and 8% judged vendor outstanding • 23 actively seeking to replace package, with 7 citing unsatisfactory performance as reason.



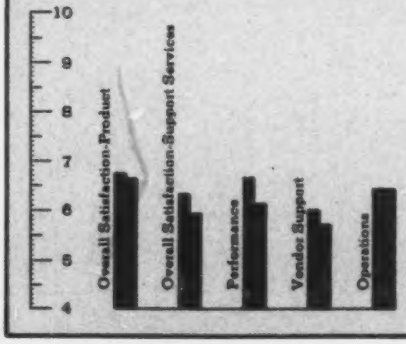
CA-SCHEDULER • Computer Associates Int'l., 70 Jericho Expressway, Jericho, NY 11753 • 516-333-6700

39 responses • 0% judged package and 5% judged vendor outstanding • 5 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



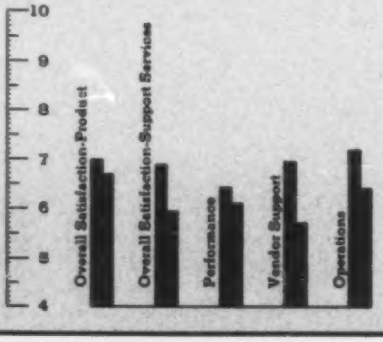
JARS • Johnson Systems (for information contact Computer Associates, Int'l.) 70 Jericho Expressway, Jericho, NY 11753 • 516-333-6700

39 responses • 5% judged package and 8% judged vendor outstanding • 1 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



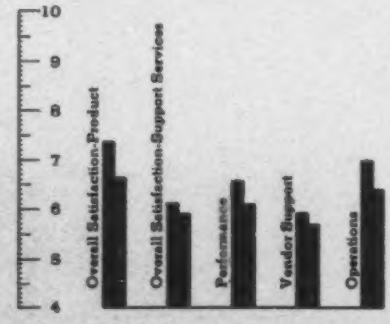
KOMAND • Pace Applied Technology, 7900 Sudley Road, Suite 602, Manassas, VA 22110 • 703-369-3200

52 responses • 19% judged package and 17% judged vendor outstanding • 5 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



UCC-7 • UCCEL Corporation, UCCEL Tower, Exchange Park, Dallas, TX 75235 • 214-353-7533

50 responses • 18% judged package and 6% judged vendor outstanding • 1 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



Rating Values

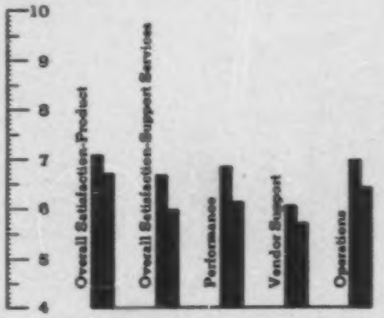
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

■ Specific Product Rating
■ Group Average Rating

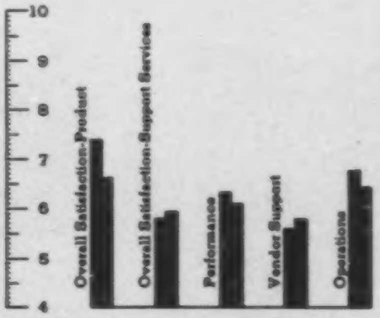
UCC-11 • UCCEL Corporation, UCCEL Tower, Exchange Park, Dallas, TX 75235 • 214-353-7533

44 responses • 21% judged package and 16% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



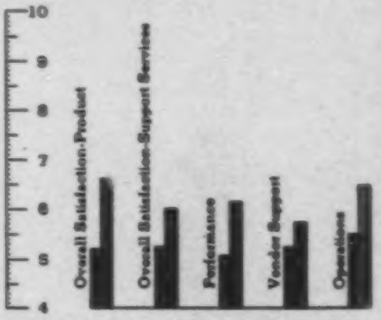
DATA CENTER MANAGER • Value Computing Inc., 498 North Kings Highway, Chery Hill, NJ 08034 • 609-482-2500

61 responses • 23% judged package and 7% judged vendor outstanding • 2 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



COMPUT-A-CHARGE • Value Computing Inc., 498 North Kings Highway, Cherry Hill, NJ 08034 • 609-482-2500

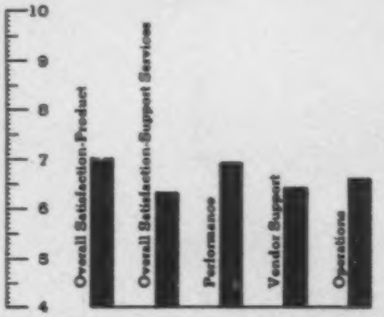
47 responses • 4% judged package and 0% judged vendor outstanding • 7 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



☐ DATA MANAGEMENT/DBMS AIDS

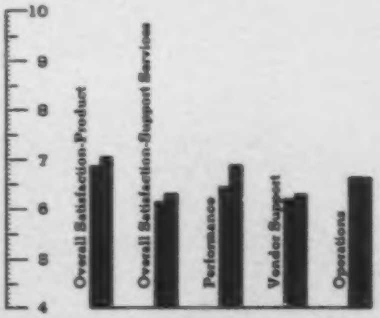
Group Average • 15 packages

884 responses • 24% judged package and 13% judged vendor outstanding • 72 actively seeking to replace package, with 11 citing unsatisfactory performance as reason.



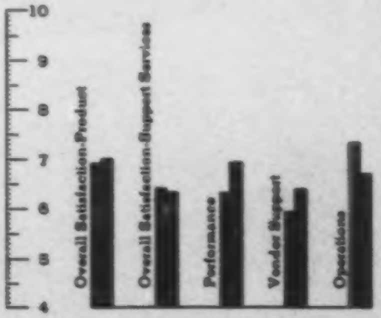
ASI-ST • Applications Software, Inc., 21515 Hawthorne Boulevard, Torrance, CA 90503 • 213-540-0111

17 responses • 12% judged package and 0% judged vendor outstanding • 5 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



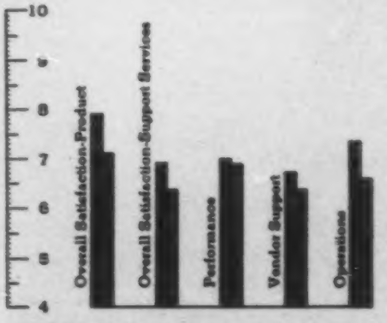
ADR/DATA DICTIONARY • Applied Data Research, Inc., Route 206 & Orchard Road, CN-8, Princeton, NJ 08540 • 201-874-9100

23 responses • 9% judged package and 13% judged vendor outstanding • 0 actively seeking to replace package.



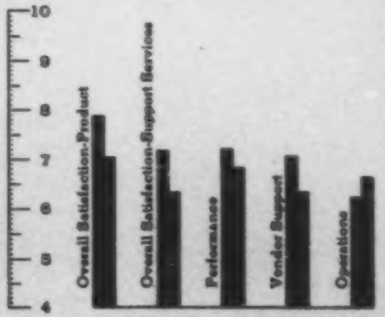
BASIS • Battelle Labs, 505 King Avenue, Columbus, OH 43201 • 614-424-5524

43 responses • 30% judged package and 19% judged vendor outstanding • 4 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



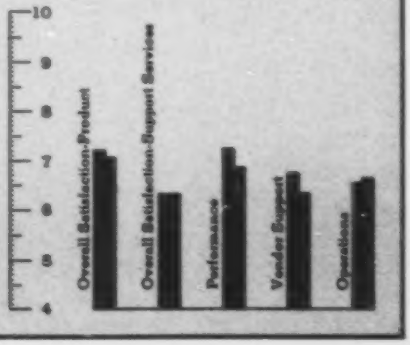
TOOL KIT • DBMS, Inc., 1801-A Mill Street, Naperville, IL 60540 • 312-961-5700

63 responses • 27% judged package and 16% judged vendor outstanding • 0 actively seeking to replace package.



DYL-280 • Dylakor, 17418 Chatsworth Street, P.O. Box 3010, Granada Hills, CA 91344 • 818-366-1781

27 responses • 30% judged package and 15% judged vendor outstanding • 6 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



Rating Values

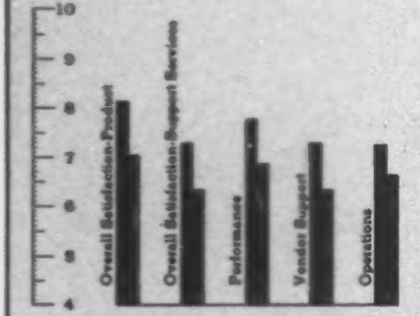
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▬ Group Average Rating

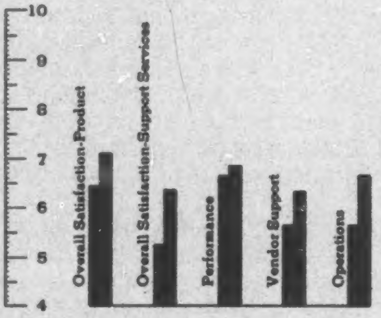
DYL-280 • Dylakor, 17418 Chatsworth Street, P.O. Box 3010, Granada Hills, CA 91344 • 818-366-1781

[illegible] responses • 40% judged package and 15% judged vendor outstanding • 3 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



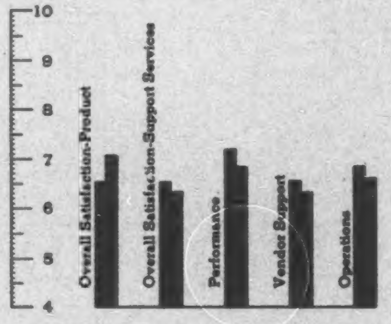
INFO • Henco Software, 100 Fifth Avenue, Waltham, MA 02154 • 617-890-8670

31 responses • 13% judged package and 0% judged vendor outstanding • 4 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



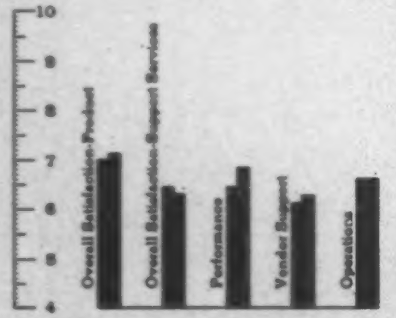
BLIS/COBOL • Information Processing Inc., 1850 Lee Road, Suite 320, Winter Park, FL 32789 • 305-647-2200

15 responses • 20% judged package and 13% judged vendor outstanding • 1 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



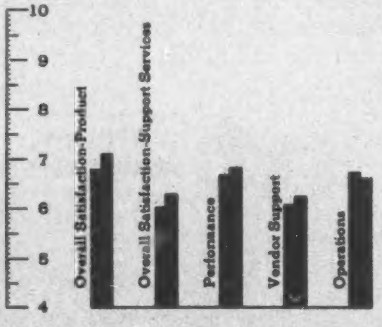
DATAMANAGER • Manager Software Products (MSP), 131 Hartwell Avenue, Lexington, MA 02173 • 617-861-6130

46 responses • 13% judged package and 11% judged vendor outstanding • 4 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



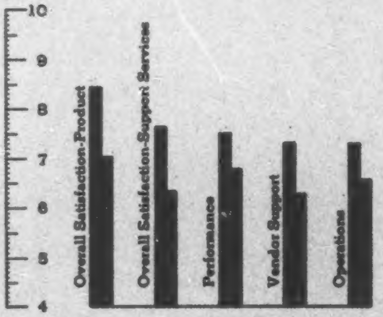
EXTRACTO • Oceanic Information Systems (Optipro), 2197 Leon-Harmel, Quebec City, POQ G1N 4N5 • 418-681-7741

32 responses • 25% judged package and 16% judged vendor outstanding • 6 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



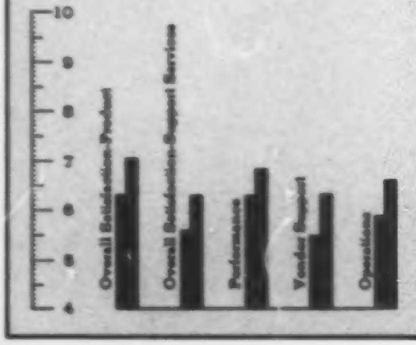
SAS • SAS Institute, SAS Circle, P.O. Box 8000, Cary, NC 27511-8000 • 919-467-8000

66 responses • 50% judged package and 26% judged vendor outstanding • 1 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



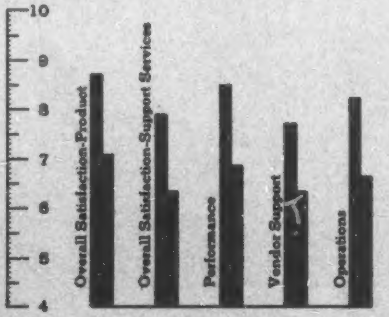
DMS • Sperry Corporation, P.O. Box 500, Blue Bell, PA 19424 • 215-542-4011

42 responses • 12% judged package and 7% judged vendor outstanding • 17 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



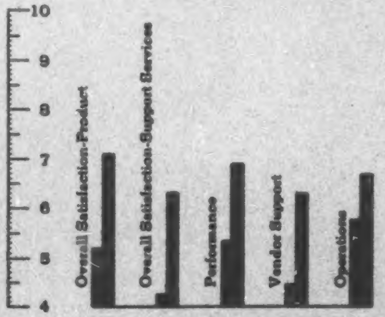
QUIKJOB III • System Support Software, 5230 Springboro Pike, Dayton, OH 45439 • 513-435-9514

19 responses • 68% judged package and 32% judged vendor outstanding • 0 actively seeking to replace package.



DATA CATALOG 2 • TSI Int'l., 187 Danbury Road, Wilton, CT 06987 • 203-853-2884

27 responses • 7% judged package and 0% judged vendor outstanding • 6 actively seeking to replace package, with 3 citing unsatisfactory performance as reason.



Rating Values

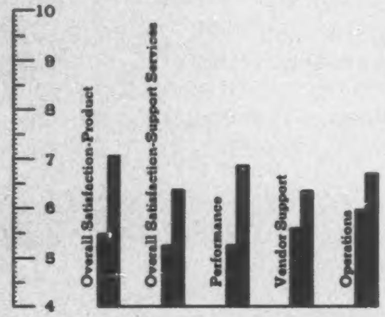
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

■ Specific Product Rating
■ Group Average Rating

UCC-10 • UCCEL Corporation, UCCEL Tower, Exchange Park, Dallas, TX •75235 214-353-7533

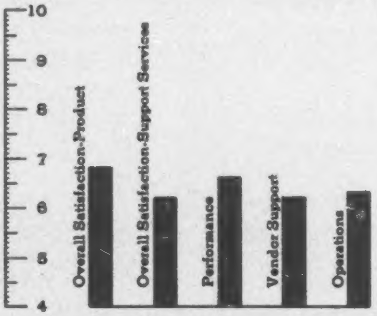
48 responses • 6% judged package and 6% judged vendor outstanding • 15 actively seeking to replace package, with 3 citing unsatisfactory performance as reason.



☐ DATABASE MANAGEMENT SYSTEMS

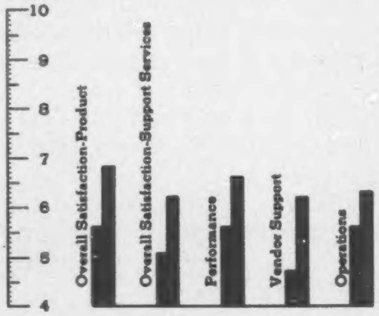
Group Average • 21 packages

792 responses • 19% judged package and 11% judged vendor outstanding • 150 actively seeking to replace package, with 32 citing unsatisfactory performance as reason.



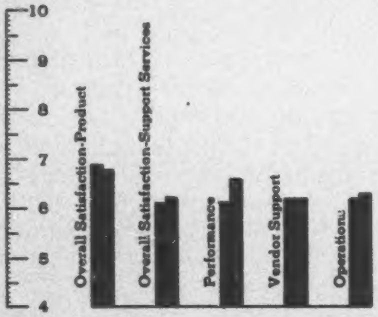
ADR/DATACOM/DB • Applied Data Research, Inc., Route 206 & Orchard Road, CN-8, Princeton, NJ 08540 • 201-874-9100

15 responses • 0% judged package and 0% judged vendor outstanding • 9 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



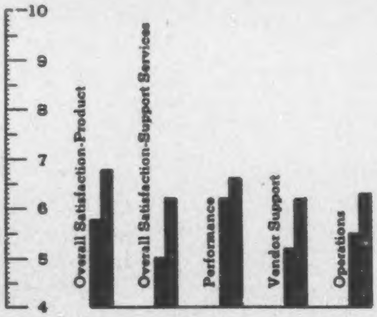
TIS • Cincom Systems, 2300 Montana Avenue, Cincinnati, OH 45211 • 513-662-2300

15 responses • 27% judged package and 13% judged vendor outstanding • 1 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



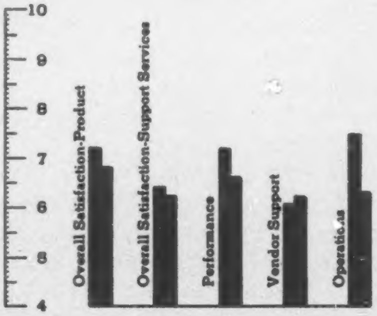
TOTAL • Cincom Systems, 2300 Montana Avenue, Cincinnati, OH 45211 • 513-662-2300

25 responses • 8% judged package and 8% judged vendor outstanding • 12 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



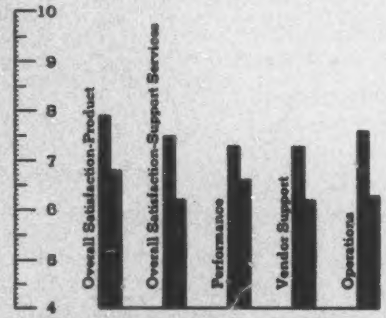
MODEL 204 • Computer Corporation of America, 4 Cambridge Center, Cambridge, MA 02142 • 617-492-8860

50 responses • 28% judged package and 12% judged vendor outstanding • 2 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



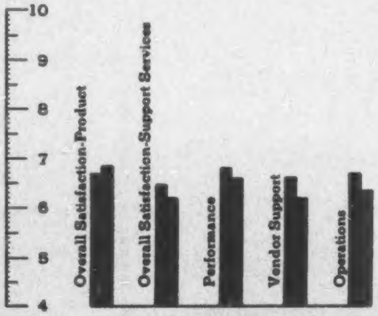
IDMS • Cullinet Software, 400 Blue Hill Drive, Westwood, MA 02090 • 617-329-7700

47 responses • 43% judged package and 26% judged vendor outstanding • 1 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



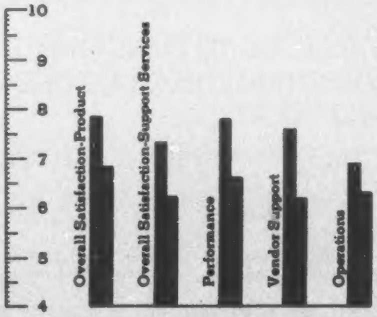
DEC DBMS • Digital Equipment Corporation, 146 Main Street, Maynard, MA 01754 • 617-897-5111

21 responses • 24% judged package and 5% judged vendor outstanding • 4 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



IMAGE/3000 • Hewlett-Packard, 3000 Hanover Street, Palo Alto, CA 94304 • 415-857-1501

46 responses • 24% judged package and 26% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



Rating Values

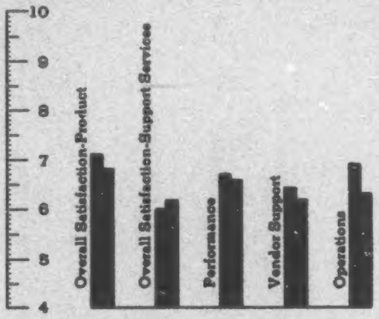
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▬ Group Average Rating

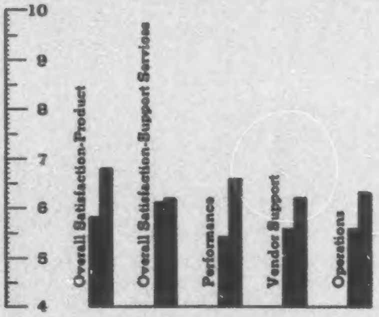
DM-IV • Honeywell Information Systems, 200 Smith Street, Waltham, MA 02154 • 617-870-5200

20 responses • 25% judged package and 5% judged vendor outstanding • 1 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



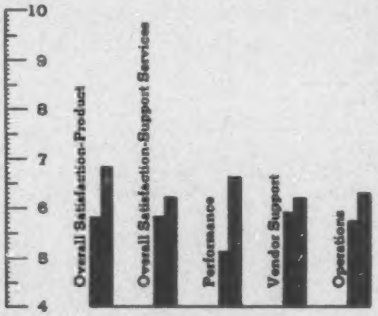
DL/1 • IBM Corporation, National Accounts Division, 1133 Westchester Avenue, White Plains, NY 10604 • 914-696-1900

35 responses • 0% judged package and 9% judged vendor outstanding • 8 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



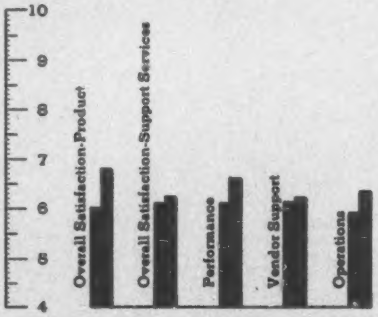
IMS/DB • IBM Corporation, National Accounts Division, 1133 Westchester Avenue, White Plains, NY 10604 • 914-696-1900

25 responses • 0% judged package and 4% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



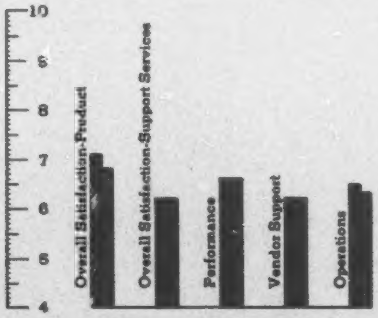
SQL/DS • IBM Corporation, National Accounts Division, 1133 Westchester Avenue, White Plains, NY 10604 • 914-696-1900

36 responses • 11% judged package and 14% judged vendor outstanding • 9 actively seeking to replace package, with 3 citing unsatisfactory performance as reason.



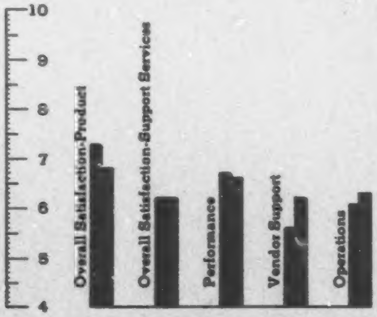
INQUIRE • Infodata Systems, 5205 Leesburg Pike, Falls Church, VA 22041 • 703-578-3430

47 responses • 23% judged package and 6% judged vendor outstanding • 6 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



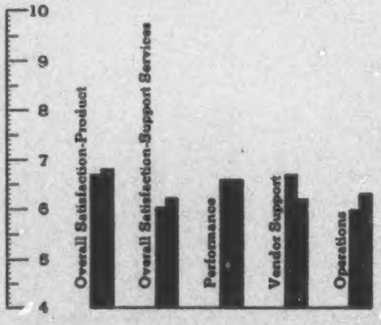
FOCUS • Information Builders, Inc., 1250 Broadway, New York, NY 10001 • 212-736-4433

80 responses • 20% judged package and 4% judged vendor outstanding • 6 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



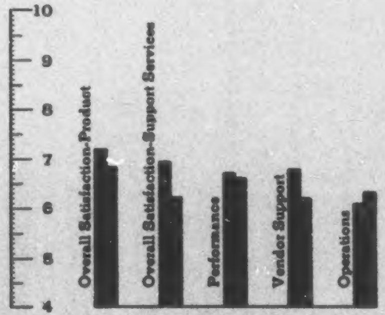
SYSTEM 2000 • Intel Systems Corporation, 12675 Research Boulevard, P.O. Box 9968, Austin, TX 78766 • 512-258-5171

35 responses • 0% judged package and 9% judged vendor outstanding • 6 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



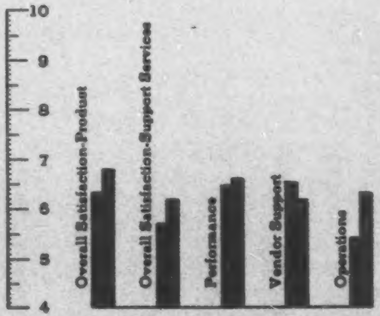
RAMIS II • Mathematica Products Group, P.O. Box 2392, Princeton, NJ 08540 • 609-799-2600

88 responses • 19% judged package and 19% judged vendor outstanding • 3 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



DPL • National Information Systems, 20370 Town Center Lane, Suite 130, Cupertino, CA 95014 • 408-257-7700

29 responses • 7% judged package and 3% judged vendor outstanding • 19 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



Rating Values

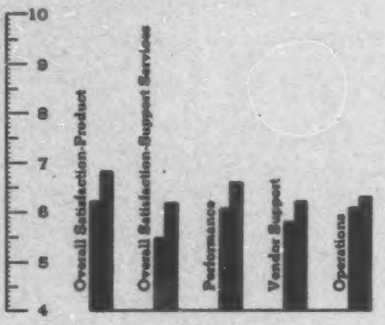
10-9: Superior
5-3: Acceptable
8-6: Very Good
2-1: Inadequate

Legend

▬ Specific Product Rating
▬ Group Average Rating

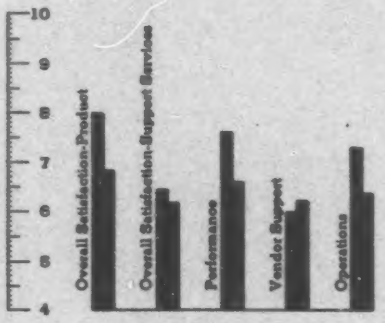
ORACLE • Oracle Corporation, 2710 Sand Hill Road, Menlo Park, CA 94025 • 415-854-7350

50 responses • 12% judged package and 8% judged vendor outstanding • 8 actively seeking to replace package, with 4 citing unsatisfactory performance as reason.



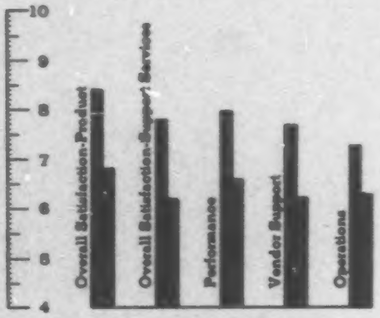
ADABAS • Software AG of North America, 11800 Sunrise Valley Drive, Reston, VA 22091 • 703-860-5050

66 responses • 40% judged package and 8% judged vendor outstanding • 3 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



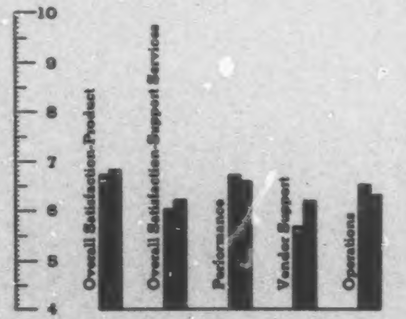
SYSTEM 1022 • Software House, 1105 Massachusetts Avenue, Cambridge, MA 02138 • 617-661-9440

53 responses • 55% judged package and 30% judged vendor outstanding • 12 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



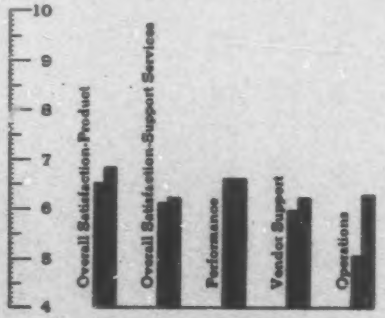
DMS - 1100 • Sperry Corporation, P.O. Box 500, Blue Bell, PA 19424 • 215-542-4011

38 responses • 13% judged package and 8% judged vendor outstanding • 3 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



DATA BASE-PLUS • Tominy, Inc., 4221 Malsbary Road, Building One, Cincinnati, OH 45439 • 513-984-6605

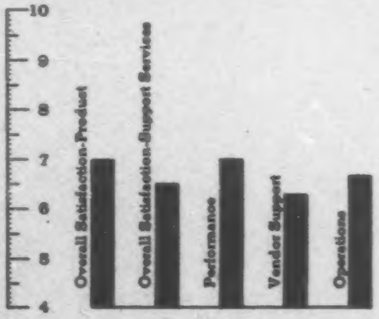
32 responses • 13% judged package and 13% judged vendor outstanding • 6 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



☐ MONITORING/PERFORMANCE AIDS

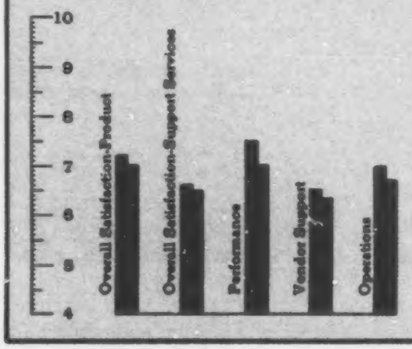
Group Average • 13 packages

804 responses • 24% judged package and 17% judged vendor outstanding • 55 actively seeking to replace package, with 10 citing unsatisfactory performance as reason.



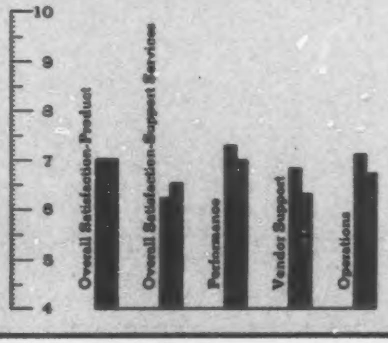
ADR/LOOK • Applied Data Research, Inc., Route 206 & Orchard Road, CN-8, Princeton, NJ 08540 • 201-874-9100

33 responses • 18% judged package and 6% judged vendor outstanding • 4 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



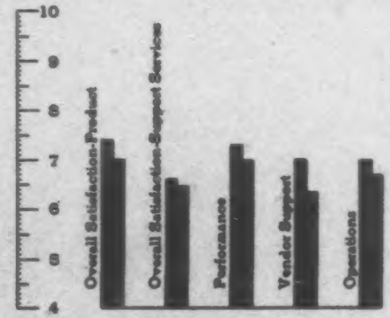
BEST/1 • BGS Systems, Inc., One University Office Park, 29 Sawyer Road, Waltham, MA 02254 • 617-890-0000

47 responses • 23% judged package and 13% judged vendor outstanding • 3 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CAPTURE/MVS • BGS Systems, Inc., One University Office Park, 29 Sawyer Road, Waltham, MA 02254 • 617-890-0000

46 responses • 26% judged package and 15% judged vendor outstanding • 5 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



Rating Values

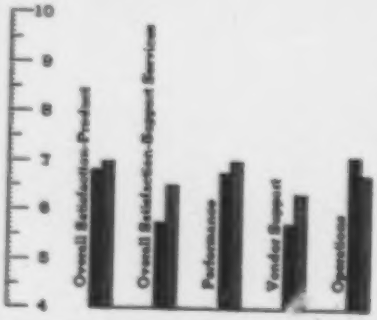
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▬ Group Average Rating

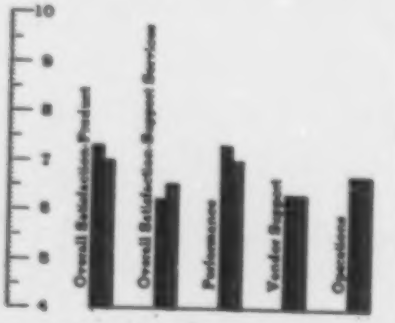
CMP/MONITOR • Boole & Babbage, Inc., 510 Oakmead Parkway, Sunnyvale, CA 94086 • 408-735-9550

67 responses • 12% judged package and 5% judged vendor outstanding • 8 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



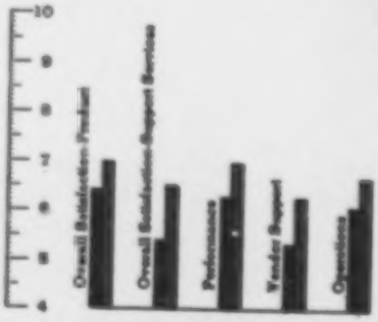
RESOLVE • Boole & Babbage, Inc., 510 Oakmead Parkway, Sunnyvale, CA 94086 • 408-735-9550

34 responses • 28% judged package and 6% judged vendor outstanding • 9 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



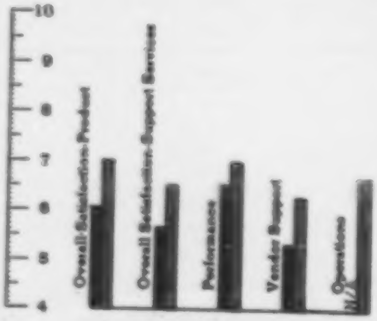
IMF • Boole & Babbage, Inc., 510 Oakmead Parkway, Sunnyvale, CA 94086 • 408-735-9550

40 responses • 10% judged package and 8% judged vendor outstanding • 7 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



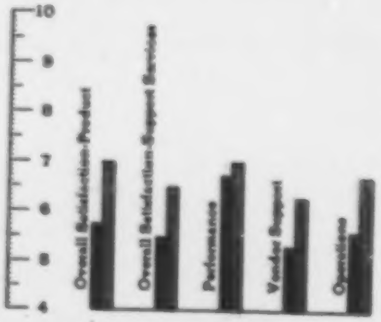
TSA • Boole & Babbage, Inc., 510 Oakmead Parkway, Sunnyvale, CA 94086 • 408-735-9550

31 responses • 10% judged package and 0% judged vendor outstanding • 4 actively seeking to replace package, with 3 citing unsatisfactory performance as reason.



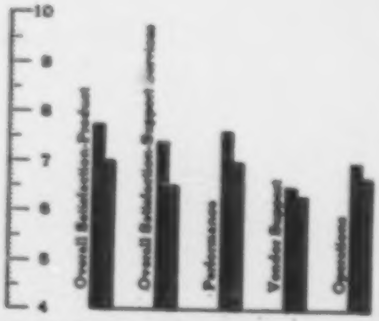
PPE • Boole & Babbage, Inc., 510 Oakmead Parkway, Sunnyvale, CA 94086 • 408-735-9550

15 responses • 7% judged package and 7% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



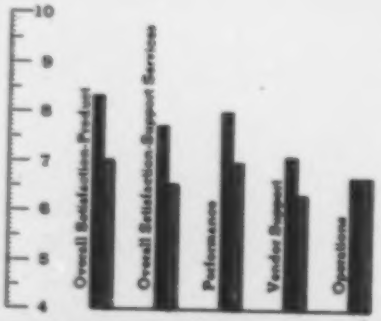
DEXAN • Candle Corporation, 10880 Wilshire Boulevard, Los Angeles, CA 90024 • 213-207-1400

15 responses • 47% judged package and 33% judged vendor outstanding • 0 actively seeking to replace package.



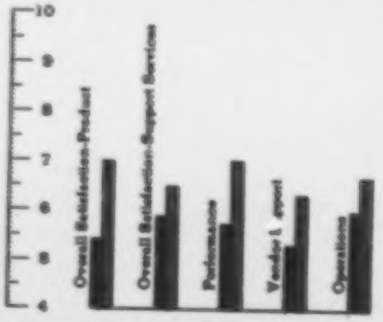
OMEGAMON • Candle Corporation, 10880 Wilshire Boulevard, Los Angeles, CA 90024 • 213-207-1400

33 responses • 55% judged package and 36% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



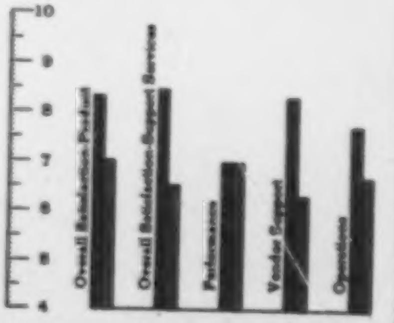
OCM • Duquesne Systems, Inc., Two Allegheny Center, Pittsburgh, PA 15212 • 412-323-2600

17 responses • 6% judged package and 0% judged vendor outstanding • 8 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



MICS • Morino Associates, 8615 Westwood Center Drive, Vienna, VA 22180 • 703-734-9494

61 responses • 44% judged package and 51% judged vendor outstanding • 0 actively seeking to replace package.



Rating Values

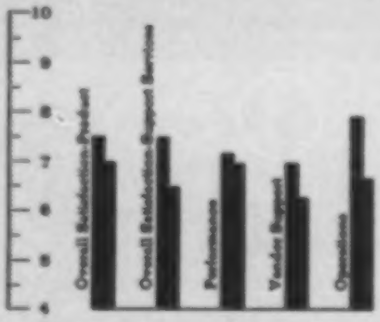
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▬ Group Average Rating

TBO/MON • Morino Associates, 8615 Westwood Center Drive, Vienna, VA 22180 • 703-734-9494

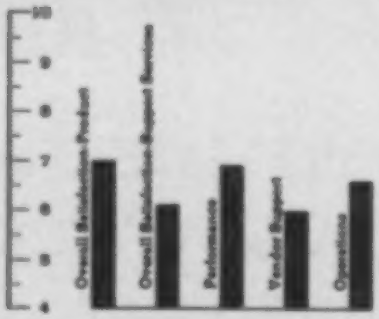
58 responses • 29% judged package and 36% judged vendor outstanding • 1 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



☐ PROGRAM DEVELOPMENT AIDS

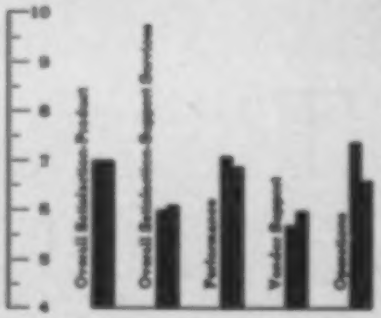
Group Average • 17 packages

626 responses • 27% judged package and 12% judged vendor outstanding • 100 actively seeking to replace package, with 19 citing unsatisfactory performance as reason.



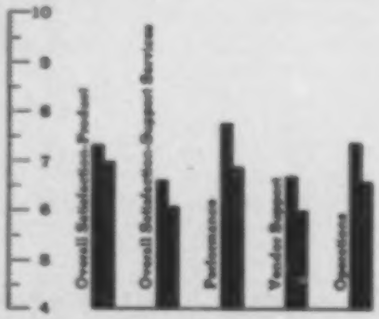
CPG • Altergo Products, 400 West Cummings Park, Suite 6900, Woburn, MA 01801 • 617-983-8811

33 responses • 24% judged package and 3% judged vendor outstanding • 8 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



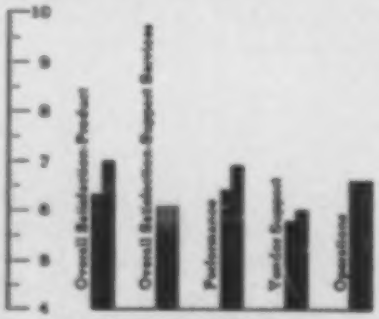
QUOTA II • Altergo Products, 400 West Cummings Park, Suite 6900, Woburn, MA 01801 • 617-983-8811

22 responses • 23% judged package and 14% judged vendor outstanding • 8 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



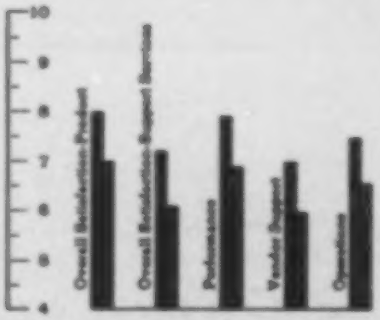
METACOBOL • Applied Data Research, Inc., Route 206 & Orchard Road, CN-8, Princeton, NJ 08540 • 201-874-9100

33 responses • 15% judged package and 9% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



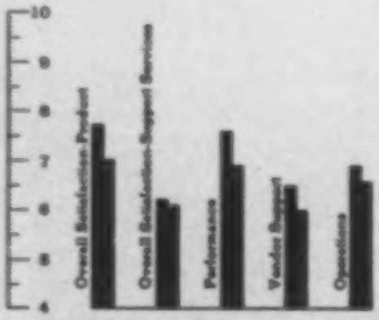
ADR/VOLLIE • Applied Data Research, Inc., Route 206 & Orchard Road, CN-8, Princeton, NJ 08540 • 201-874-9100

67 responses • 30% judged package and 19% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



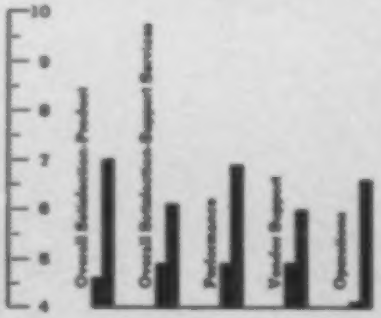
MANTIS • Cincom Systems, 2300 Montana Avenue, Cincinnati, OH 45211 • 513-662-2300

30 responses • 30% judged package and 7% judged vendor outstanding • 4 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



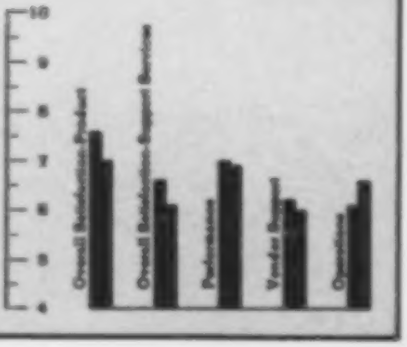
DMS • IBM Corporation, National Accounts Division, 1133 Westchester Avenue, White Plains, NY 10604 • 914-696-1900

24 responses • 0% judged package and 4% judged vendor outstanding • 11 actively seeking to replace package, with 7 citing unsatisfactory performance as reason.



ISPF • IBM Corporation, National Accounts Division, 1133 Westchester Avenue, White Plains, NY 10604 • 914-696-1900

29 responses • 21% judged package and 17% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



Rating Values

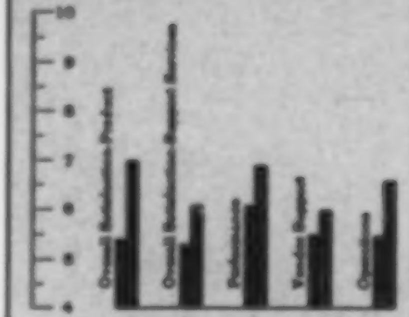
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

■ Specific Product Rating
■ Group Average Rating

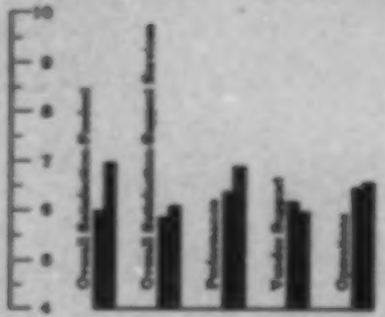
MARK IV • Informatics General Corporation, 21031 Ventura Boulevard, Woodland Hills, CA 91364 • 213-887-9040

87 responses • 7% judged package and 7% judged vendor outstanding • 11 actively seeking to replace package, with 4 citing unsatisfactory performance as reason.



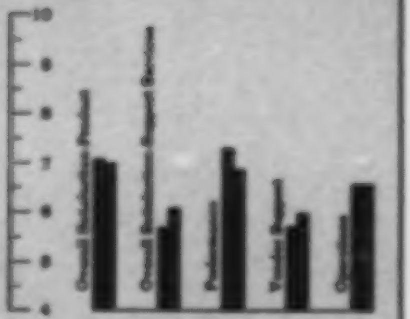
DATAMACS • Management & Computer Services, Great Valley Corporate Center, Valley Forge, PA 19482 • 215-648-0730

21 responses • 5% judged package and 5% judged vendor outstanding • 1 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



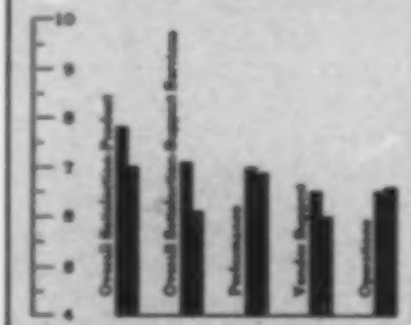
WYLBUR • On-Line Business Systems, 115 Sansome Street, San Francisco, CA 94104 • 415-391-9555

96 responses • 21% judged package and 9% judged vendor outstanding • 9 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



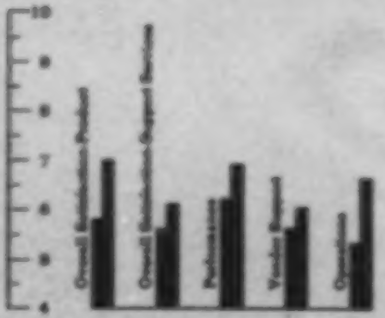
INTERTEST • On-Line Software Int'l, Fort Lee Executive Park, Two Executive Drive, Fort Lee, NJ 07024 • 201-592-0009

41 responses • 39% judged package and 29% judged vendor outstanding • 1 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



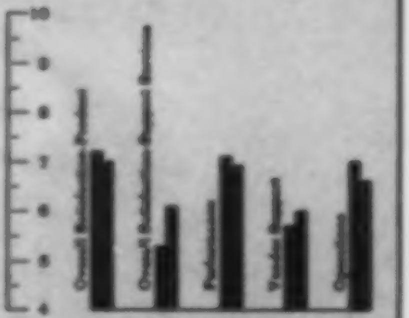
UFO • Oxford Software, 174 Boulevard, Hasbrouck Heights, NJ 07604 • 201-288-1515

38 responses • 0% judged package and 3% judged vendor outstanding • 8 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



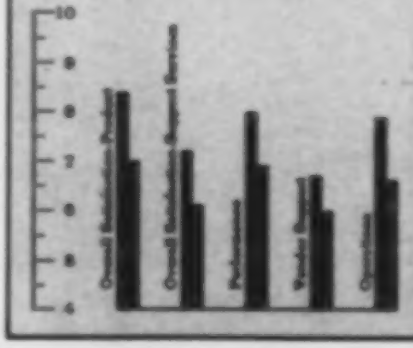
O-W-L • Pansophic Systems, 709 Enterprise Drive, Oakbrook, IL 60521 • 312-986-2263

69 responses • 29% judged package and 12% judged vendor outstanding • 8 actively seeking to replace package, with 4 citing unsatisfactory performance as reason.



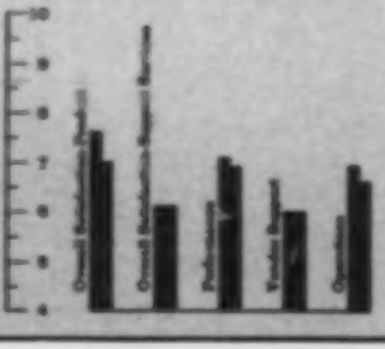
CONDOR • Phoenix Computer Corporation, 11944 Jefferson Boulevard, Culver City, CA 90230 • 213-827-4500

63 responses • 60% judged package and 32% judged vendor outstanding • 4 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



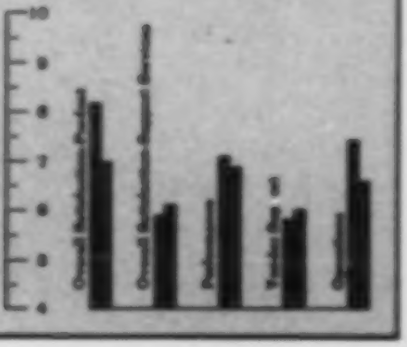
NATURAL • Software AG of North America, 11800 Sunrise Valley Drive, Reston, VA 22091 • 703-860-5050

67 responses • 29% judged package and 9% judged vendor outstanding • 1 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



MAPPER • Sperry Corporation, P.O. Box 500, Blue Bell, PA 19424 • 215-542-4011

89 responses • 43% judged package and 11% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



Rating Values

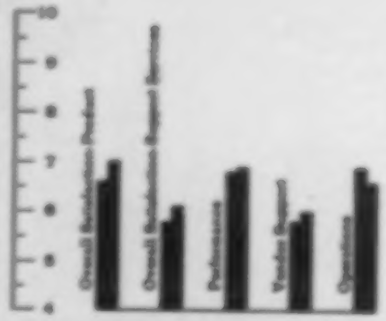
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

■ Specific Product Rating
■ Group Average Rating

SPEED I • TOM Software, P.O. Box 66596, Seattle, WA 98166 • 206-246-7022

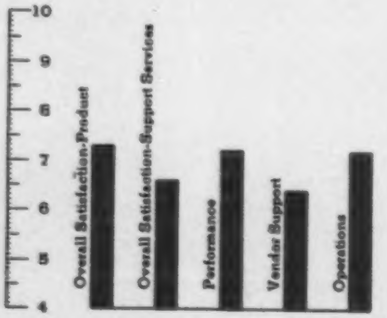
37 responses • 19% judged package and 14% judged vendor outstanding • 3 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



☐ MEDIA CONTROL/RESOURCE MANAGEMENT

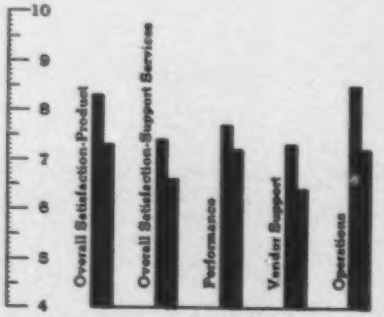
Group Average • 16 packages

738 responses • 26% judged package and 14% judged vendor outstanding • 74 actively seeking to replace package, with 7 citing unsatisfactory performance as reason.



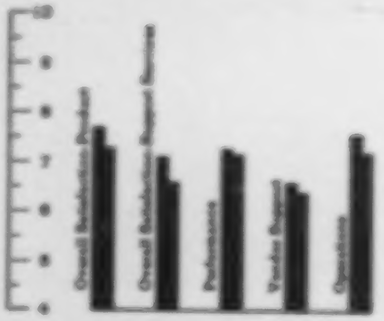
ACF 2 • Cambridge Systems Group, 1333 Lawrence Expressway, Suite 440, Santa Clara, CA 95051 • 415-941-4558

62 responses • 47% judged package and 31% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



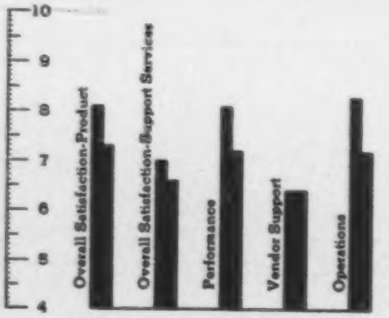
ASM 2 • Cambridge Systems Group, 1333 Lawrence Expressway, Suite 440, Santa Clara, CA 95051 • 415-941-4558

70 responses • 26% judged package and 10% judged vendor outstanding • 9 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



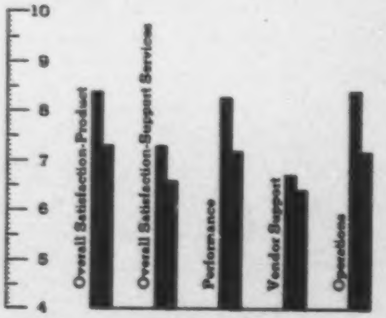
MSM • CGA Computer Inc., 960 Holmdel Road, Holmdel, NJ 07733 • 201-946-8900

46 responses • 39% judged package and 15% judged vendor outstanding • 1 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



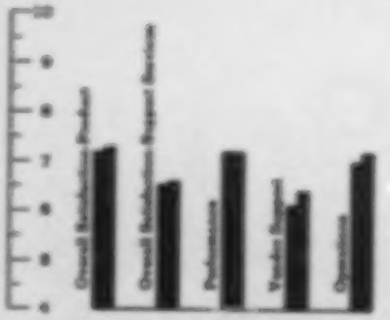
SUPER MSI • CGA Computer Inc., 960 Holmdel Road, Holmdel, NJ 07733 • 201-946-8900

50 responses • 52% judged package and 22% judged vendor outstanding • 4 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



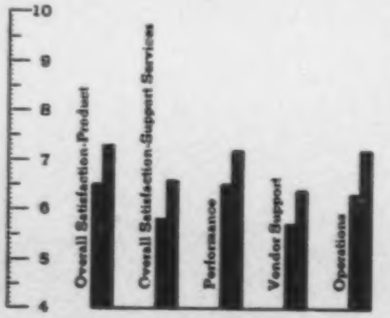
CA-DYNAM/D • Computer Associates Int'l., 70 Jericho Expressway, Jericho, NY 11753 • 516-333-6700

[illegible] responses • 15% judged package and 6% judged vendor outstanding • 4 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



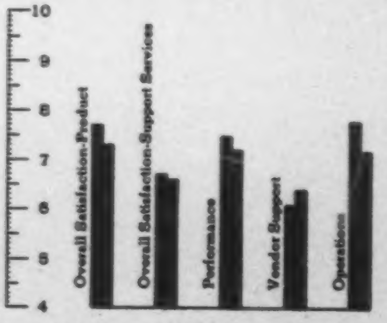
CA-TLMS • Computer Associates Int'l., 70 Jericho Expressway, Jericho, NY 11753 • 516-333-6700

35 responses • 14% judged package and 6% judged vendor outstanding • 4 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CA-DYNAM/FI • Computer Associates Int'l., 70 Jericho Expressway, Jericho, NY 11753 • 516-333-6700

30 responses • 33% judged package and 20% judged vendor outstanding • 4 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



Rating Values

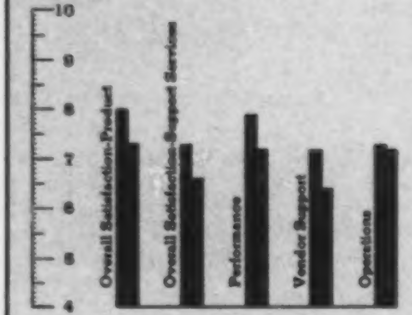
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▬ Group Average Rating

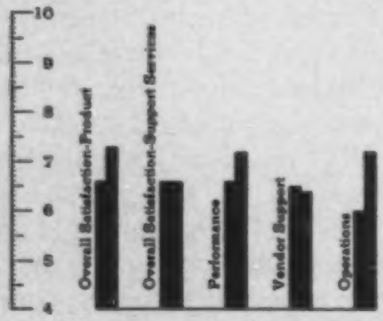
SYSTEM/MANAGER • Corodale Systems, 211 Congress Street, Boston, MA 02110 • 617-426-8780

64 responses • 44% judged package and 27% judged vendor outstanding • 5 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



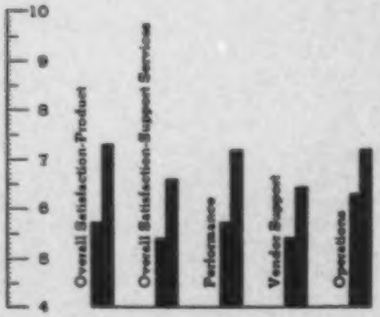
PANAUDIT • Pansophic Systems, 709 Enterprise Drive, Oakbrook, IL 60521 • 312-986-2263

30 responses • 13% judged package and 13% judged vendor outstanding • 1 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



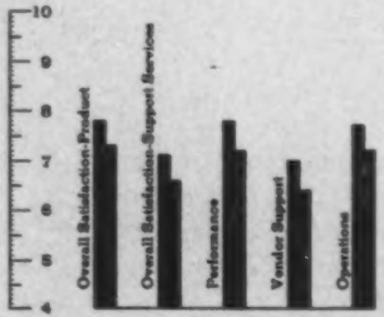
PANEXEC •Pansophic Systems, 709 Enterprise Drive, Oakbrook, IL 60521 • 312-986-2263

32 responses • 3% judged package and 6% judged vendor outstanding • 5 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



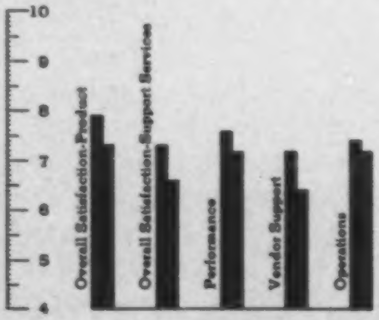
EPAT • SDI, Inc., 1700 South El Camino Real, P.O. Box 5801, San Mateo, CA 94402 • 405-572-1200

60 responses • 42% judged package and 22% judged vendor outstanding • 12 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



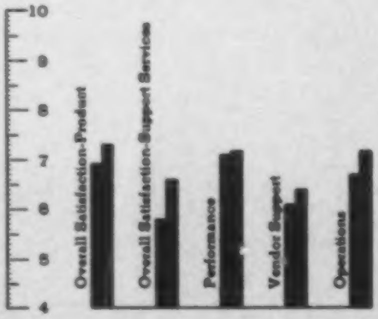
DMS/OS • Sterling Software Marketing, Crocker Bank Building, Suite 500, 1007 Seventh Street, Sacramento, CA 95814 • 916-441-7234

63 responses • 32% judged package and 16% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



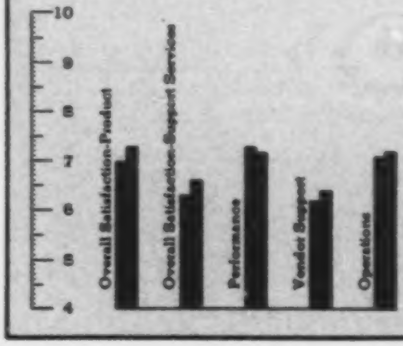
DFAST • Tower Systems Int'l., 19782 MacArthur Boulevard, Suite 365, Irvine, CA 92715 • 714-752-8263

35 responses • 20% judged package and 17% judged vendor outstanding • 7 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



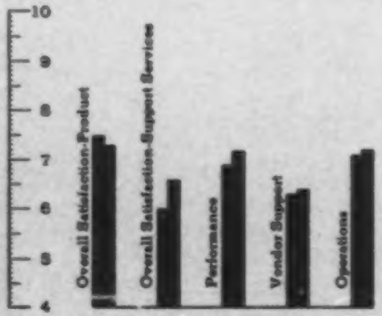
TFAST • Tower Systems Int'l., 19782 MacArthur Boulevard, Suite 365, Irvine, CA 92715 • 714-752-8263

33 responses • 9% judged package and 6% judged vendor outstanding • 4 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



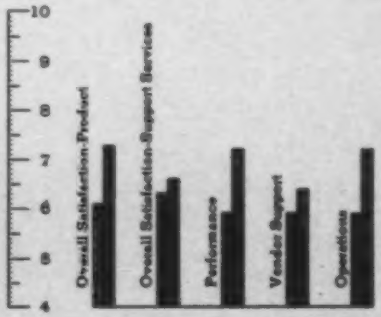
UCC-1 • UCCEL Corporation, UCCEL Tower, Exchange Park, Dallas, TX 75235 • 214-353-7533

38 responses • 21% judged package and 0% judged vendor outstanding • 1 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



UCC-3 •UCCEL Corporation, UCCEL Tower, Exchange Park, Dallas, TX 75235 • 214-353-7533

38 responses • 5% judged package and 5% judged vendor outstanding • 5 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



Rating Values

10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

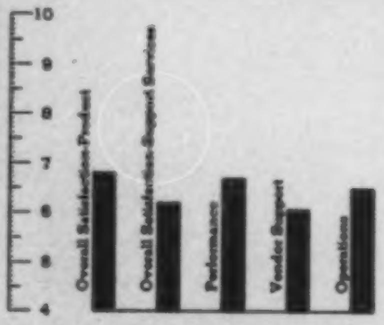
Legend

▬ Specific Product Rating
▬ Group Average Rating

☐ QUERY/REPORT WRITERS

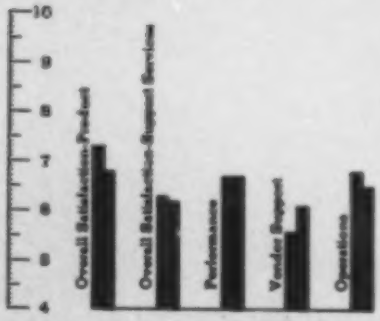
Group Average • 11 packages

369 responses • 21% judged package and 9% judged vendor outstanding • 41 actively seeking to replace package, with 7 citing unsatisfactory performance as reason.



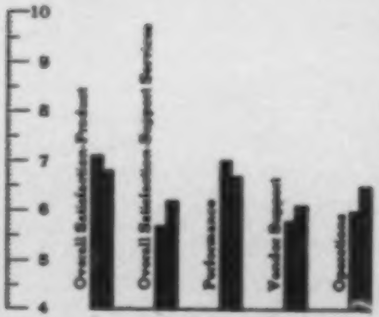
ADR/DATAQUERY • Applied Data Research, Inc., Route 206 & Orchard Road, CN-8, Princeton, NJ 08540 • 201-874-9100

17 responses • 35% judged package and 12% judged vendor outstanding • 1 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



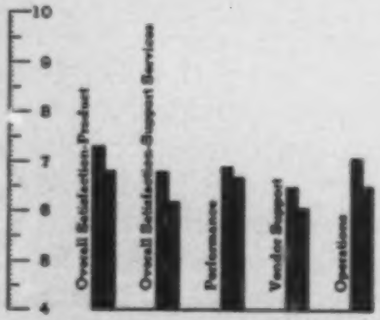
CA-EARL • Computer Associates Int'l., 70 Jericho Expressway, Jericho, NY 11753 • 516-333-6700

17 responses • 12% judged package and 6% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



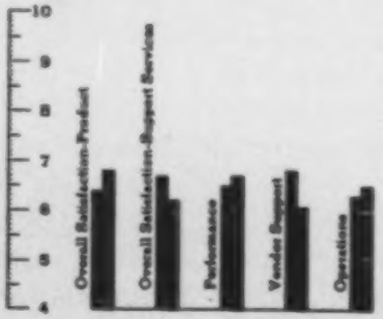
EDP-AUDITOR • Cullinet Software, 400 Blue Hill Drive, Westwood, MA 02090 • 617-329-7700

16 responses • 25% judged package and 6% judged vendor outstanding • 1 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



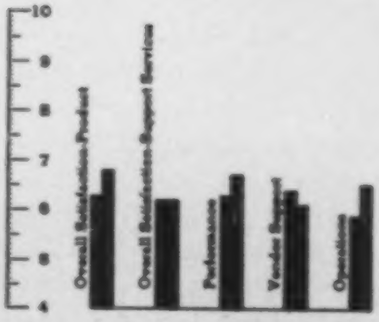
CULPRIT • Cullinet Software, 400 Blue Hill Drive, Westwood, MA 02090 • 617-329-7700

47 responses • 9% judged package and 15% judged vendor outstanding • 3 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



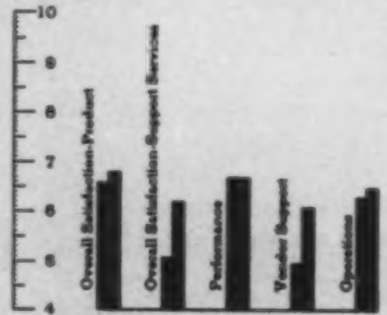
DATATRIEVE • Digital Equipment Corporation, 146 Main Street, Maynard, MA 01754 • 617-897-5111

40 responses • 10% judged package and 5% judged vendor outstanding • 2 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



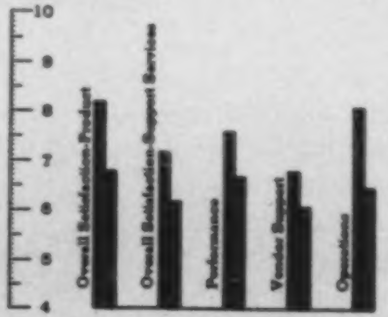
KEYFAST • H&M Systems Software, 351 Evelyn Street, Paramus, NJ 07652 • 201-599-9111

48 responses • 20% judged package and 9% judged vendor outstanding • 4 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



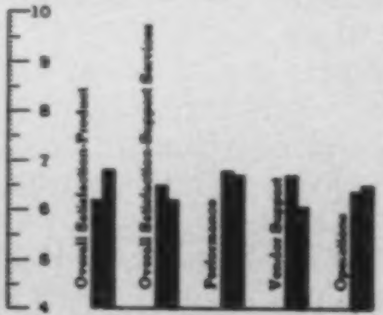
OMNI • Haverly Systems, 78 Broadway, P.O. Box 919, Denville, NJ 07834 • 201-627-1424

33 responses • 52% judged package and 19% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



QUERY/3000 • Hewlett-Packard, 3000 Hanover Street, Palo Alto, CA 94304 • 415-857-1501

43 responses • 9% judged package and 9% judged vendor outstanding • 11 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



Rating Values

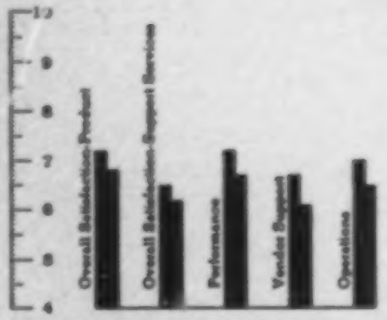
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▬ Group Average Rating

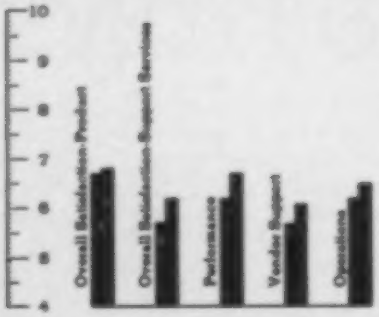
EASYTRIEVE • Panesophic Systems, 709 Enterprise Drive, Oakbrook, IL 60521 • 312-986-2263

40 responses • 25% judged package and 18% judged vendor outstanding • 1 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



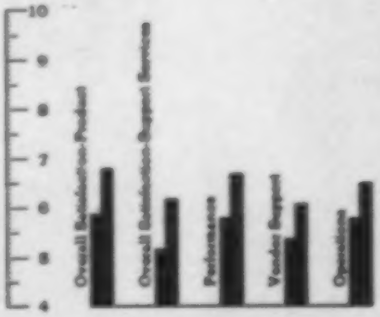
AUDIT ANALYZER • TSI Int'l., 187 Danbury Road, Wilton, CT 06987 • 203-853-2884

23 responses • 26% judged package and 4% judged vendor outstanding • 3 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



DATA ANALYZER • TSI Int'l., 187 Danbury Road, Wilton, CT 06987 • 203-853-2884

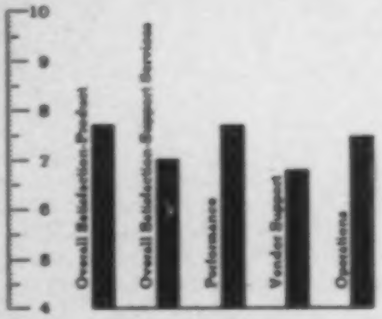
48 responses • 6% judged package and 7% judged vendor outstanding • 13 actively seeking to replace package, with 3 citing unsatisfactory performance as reason.



☐ UTILITIES/OPERATING SYSTEMS/ENHANCEMENTS

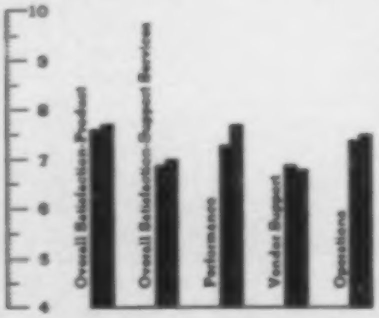
Group Average • 24 packages

1111 responses • 38% judged package and 22% judged vendor outstanding • 122 actively seeking to replace package, with 22 citing unsatisfactory performance as reason.



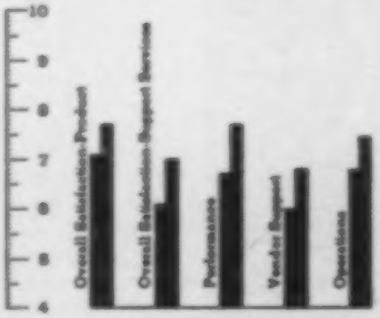
ADR/LIBRARIAN • Applied Data Research, Inc., Route 206 & Orchard Road, CN-8, Princeton, NJ 08540 • 201-874-9100

45 responses • 40% judged package and 20% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



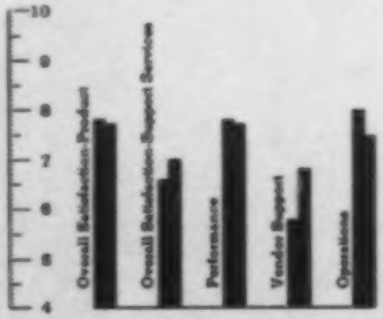
BOSS/3 • Century Analysis Inc., 80 Berry Drive, Pacheco, CA 94553 • 415-680-7800

84 responses • 15% judged package and 9% judged vendor outstanding • 10 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



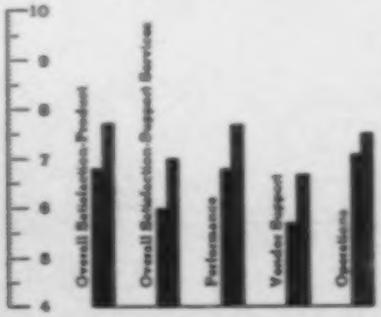
TOP SECRET • CGA Computer Inc., 960 Holmdel Road, Holmdel, NJ 07733 • 201-946-8900

[illegible] responses • 41% judged package and 14% judged vendor outstanding • 1 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



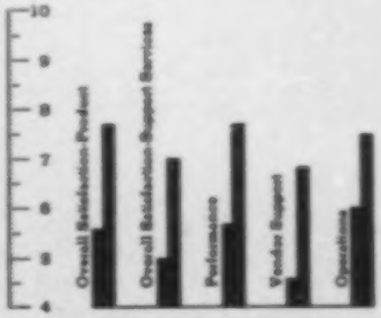
CA-DRIVER • Computer Associates Int'l., 70 Jericho Expressway, Jericho, NY 11753 • 516-333-6700

30 responses • 30% judged package and 13% judged vendor outstanding • 3 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CA-JASPER • Computer Associates Int'l., 70 Jericho Expressway, Jericho, NY 11753 • 516-333-6700

37 responses • 3% judged package and 5% judged vendor outstanding • 10 actively seeking to replace package, with 3 citing unsatisfactory performance as reason.



Rating Values

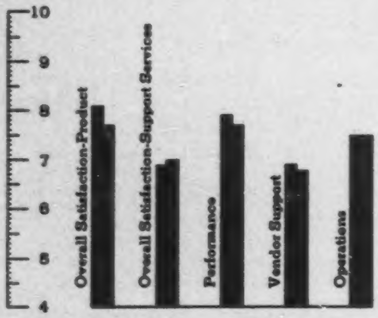
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▬ Group Average Rating

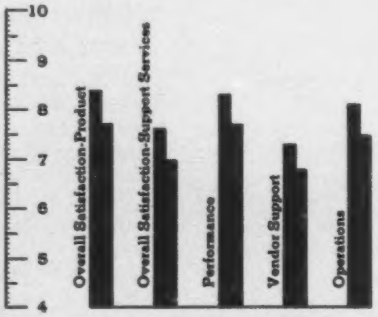
CA-RAPS • Computer Associates Int'l., 70 Jericho Expressway, Jericho, NY 11753 • 516-333-6700

44 responses • 34% judged package and 16% judged vendor outstanding • 3 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



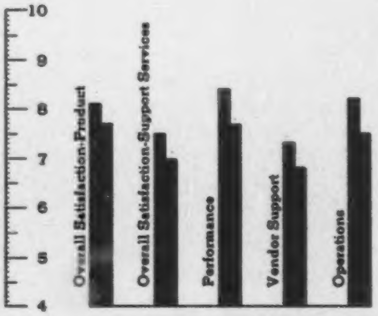
CA-SORT • Computer Associates Int'l., 70 Jericho Expressway, Jericho, NY 11753 • 516-333-6700

48 responses • 54% judged package and 27% judged vendor outstanding • 2 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



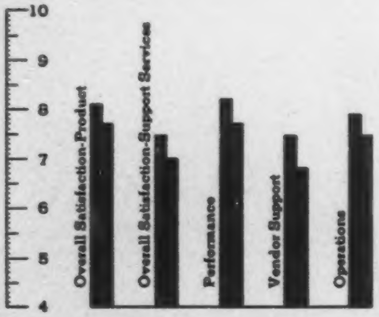
ABEND-AID • Compuware Corporation, 32100 Telegraph Road, Birmingham, MI 48010 • 313-540-0900

51 responses • 39% judged package and 26% judged vendor outstanding • 0 actively seeking to replace package.



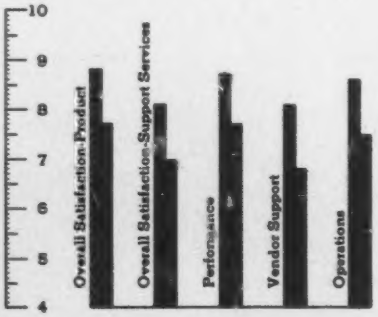
FAQS/XP • Goal Systems Int'l., 5455 North High Street, Columbus, OH 43214 • 614-888-1775

20 responses • 40% judged package and 30% judged vendor outstanding • 1 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



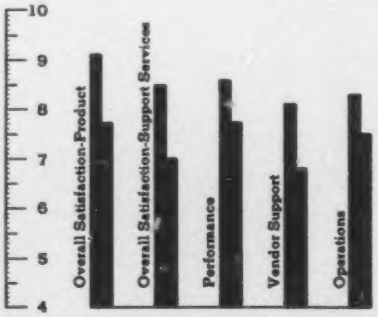
FAVER/XP • Goal Systems Int'l., 5455 North High Street, Columbus, OH 43214 • 614-888-1775

44 responses • 59% judged package and 39% judged vendor outstanding • 0 actively seeking to replace package.



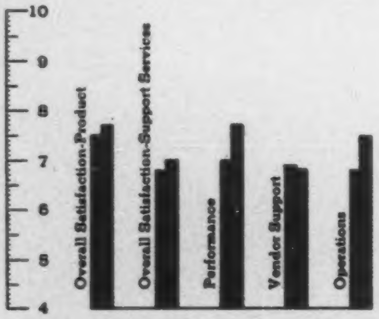
FLEE/XP • Goal Systems Int'l., 5455 North High Street, Columbus, OH 43214 • 614-888-1775

44 responses • 75% judged package and 52% judged vendor outstanding • 1 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



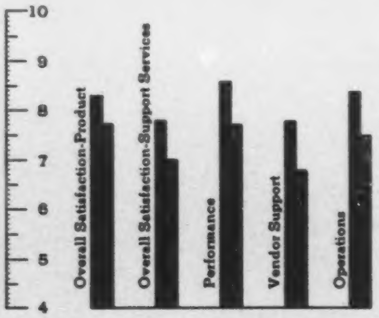
IMSL LIBRARY • IMSL, Inc., NBC Building, 6th Floor, 7500 Bellaire Boulevard, Houston, TX 77036 • 713-772-1927

39 responses • 13% judged package and 8% judged vendor outstanding • 1 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



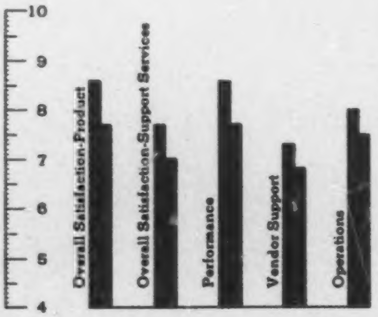
FDR • Innovation Data Processing, 970 Clifton Avenue, Clifton, NJ 07013 • 201-777-1940

57 responses • 53% judged package and 30% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



LOGOUT/MULTILOG • Macro 4, Inc., One West Hanover Avenue, Mount Freedom, NJ 07970 • 201-895-4800

66 responses • 56% judged package and 30% judged vendor outstanding • 5 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



Rating Values

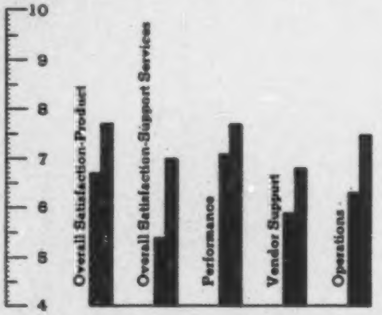
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

■ Specific Product Rating
■ Group Average Rating

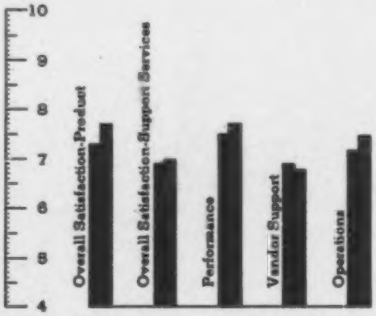
EDOS • Nixdorf Computer Software Co., 300 Third Avenue, Waltham, MA 02154 • 617-890-3600

36 responses • 14% judged package and 8% judged vendor outstanding • 23 actively seeking to replace package, with 3 citing unsatisfactory performance as reason.



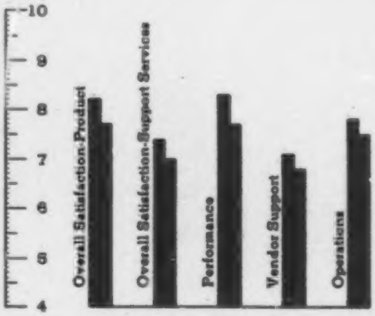
PANVALET • Pansophic Systems, 709 Enterprise Drive, Oakbrook, IL 60521 • 312-986-2263

37 responses • 16% judged package and 14% judged vendor outstanding • 4 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



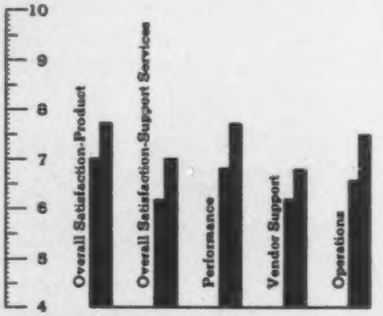
INSTANT FBA • SDI, Inc., 1700 South El Camino Real, P.O. Box 5801, San Mateo, CA 94402 • 405-572-1200

59 responses • 54% judged package and 25% judged vendor outstanding • 11 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



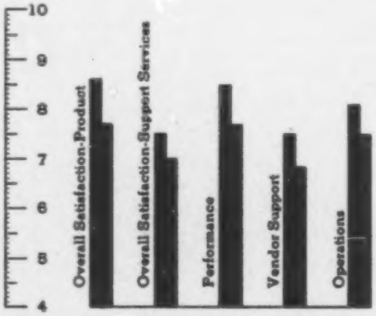
KEY/MASTER • TSI Int'l., 187 Danbury Road, Wilton, CT 06987 • 203-853-2884

60 responses • 18% judged package and 7% judged vendor outstanding • 2 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



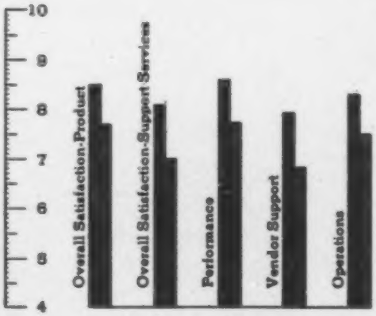
DOS/MVT/VSE • Software Pursuits, Inc., 444 Market Street, Suite 800, San Francisco, CA 94111 • 415-392-7171

60 responses • 65% judged package and 23% judged vendor outstanding • 9 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



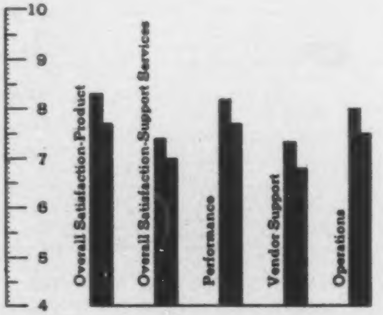
SYNCSORT-DOS • Syncsort, Inc., 560 Sylvan Avenue, Englewood Cliffs, NJ 07632 • 201-568-9700

81 responses • 57% judged package and 37% judged vendor outstanding • 3 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



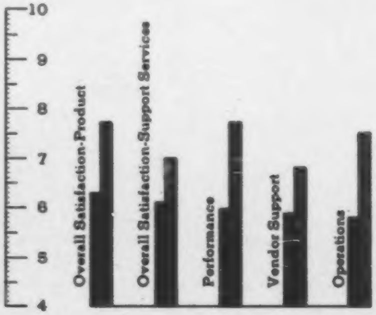
SYNCSORT-OS • Syncsort, Inc., 560 Sylvan Avenue, Englewood Cliffs, NJ 07632 • 201-568-9700

84 responses • 59% judged package and 26% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



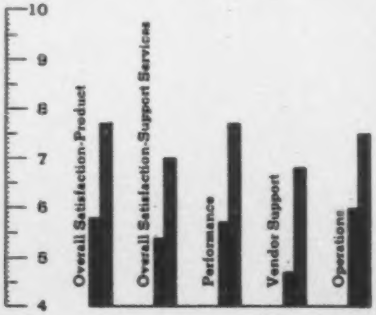
UCC-2 •UCCEL Corporation, UCCEL Tower, Exchange Park, Dallas, TX 75235 • 214-353-7533

30 responses • 10% judged package and 7% judged vendor outstanding • 8 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



VALU-LIB • Value Computing Inc., 498 North Kings Highway, Cherry Hill, NJ 08034 • 609-482-2500

46 responses • 7% judged package and 4% judged vendor outstanding • 4 actively seeking to replace package, with 3 citing unsatisfactory performance as reason.



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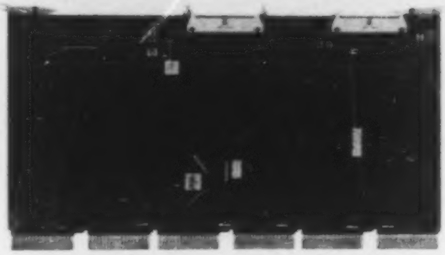

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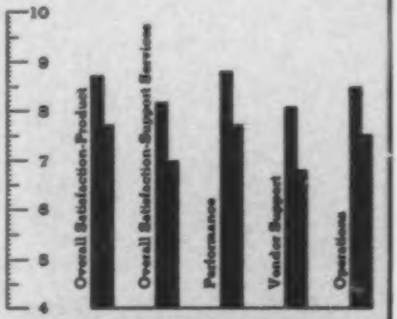
DISK UTILITIES • Westinghouse Electric, 777 Penn Center, 7th Floor, Pittsburgh, PA 15235 • 412-636-3100

41 responses • 61% judged package and 46% judged vendor outstanding • 1 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



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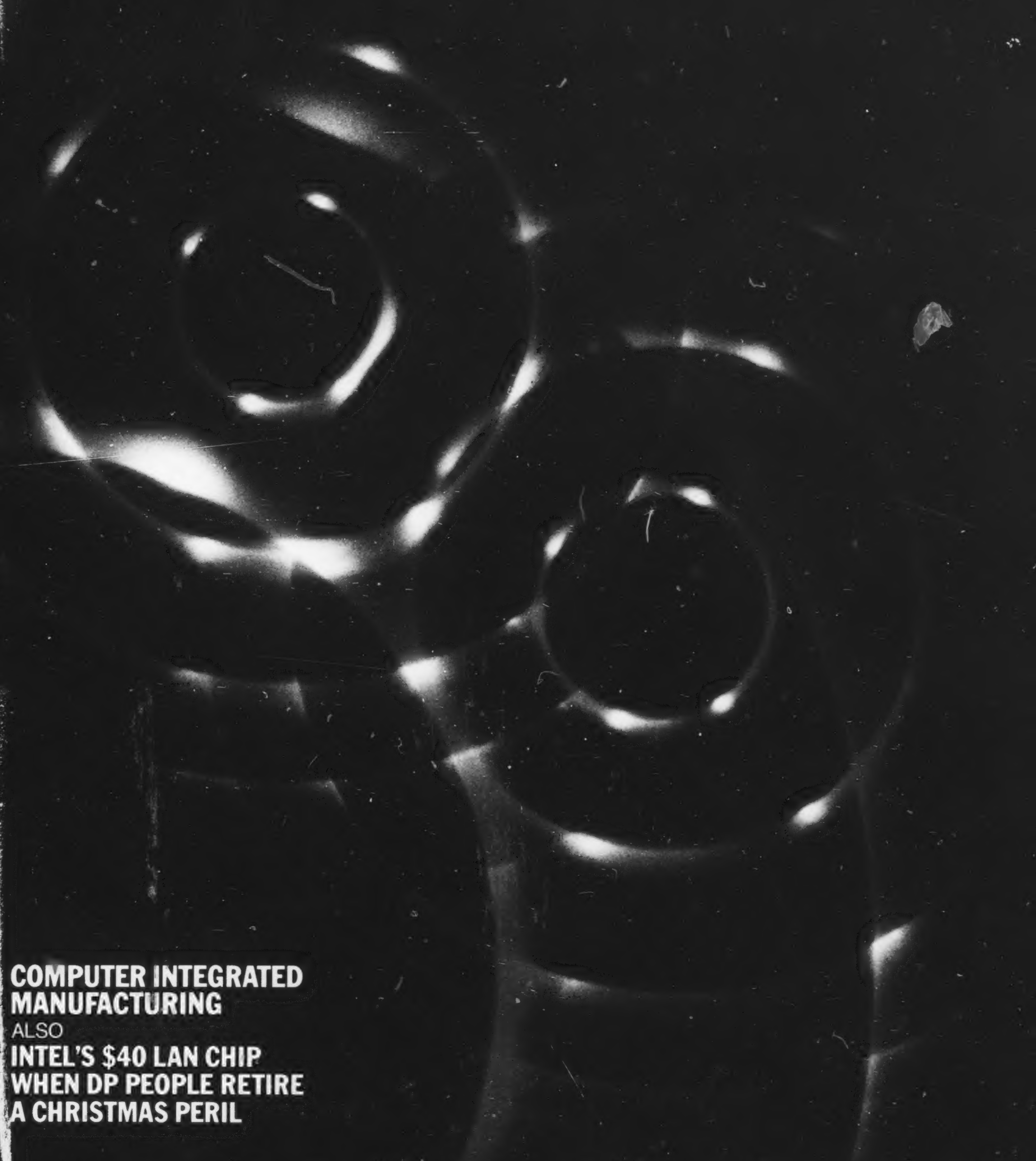

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A CHRISTMAS PERIL

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FEATURES

32
IN FOCUS

Deborah Sojka reports that whether or not retiring computer people are "Shucking Dp," they're finding that the world is their oyster.

66
THE STATE OF CIM
Daniel S. Appleton

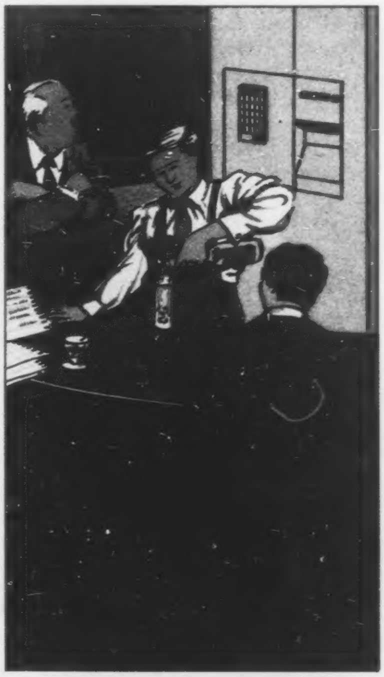
Whether it's a system, a project, a product, a philosophy, a program, or a concept, it should revolutionize manufacturing.

78
A CHRISTMAS PERIL
Jackson W. Granholm

Deck the halls and all that.

86
THE IMPORTANCE OF GOOD RELATIONS
Tony Percy

Wth proper application and the correct tools, businesses can benefit from modeling the data relationships that are key to how they function.



To a Special Strategic Plan

96
ENTERPRISE ANALYSIS
James R. Johnson

Hallmark Cards achieves an optimal MIS portfolio by integrating business and MIS plans and selecting the appropriate technology for implementation.

107
BLUE SKIES AHEAD
J. Daniel Couger

Programmer positions are increasing and dp career paths are expanding. The trend is predicted to continue.

115
SOFTWARE QUALITY MEASUREMENT
Jay Arthur

One more tool to aid in the development and maintenance of high-quality software, and to stimulate higher productivity.

NEWS IN PERSPECTIVE

40 **SUPERMINIS**
Open season on DEC.

42 **LANS**
Intel's LAN on a chip.

44 **WORKSTATIONS**
Few rave about PC/Fones.

48 **TELECOMMUNICATIONS**
Digital dialing doldrums.
U.K. bans IBM/BT VAN plan.

62 **BENCHMARKS**

DEPARTMENTS

8 **LOOKING BACK**
13 **LOOK AHEAD**
18 **CALENDAR**
23 **LETTERS**
29 **EDITORIAL**

125 **HARDWARE**
131 **SOFTWARE**
134 **MARKETPLACE**
135 **ON THE JOB**
139 **READERS' FORUM**
140 **ADVERTISERS' INDEX**

OEM SUPPLEMENT 124-1

-5 **SIZING UP DISK DRIVES**
-13 **IS FT FOR THEE?**

COVER PHOTOGRAPH BY
PETER ANGELO SIMON

ERRATA

The ratings for ADR/DATACOM/DB, a product of Applied Data Research Inc. of Princeton, NJ, published in the December 1st issue of DATAMATION are incorrect. Data Decisions Inc. of Cherry Hill, NJ, producers of our annual Systems Software Survey, inadvertently surveyed users of a discontinued and unrelated product rather than users of ADR/DATACOM/DB. Thus the ratings that appear under that heading bear no relationship at all to ADR's data base management system product. DATAMATION apologizes to ADR, its customers, and our readers for this error.

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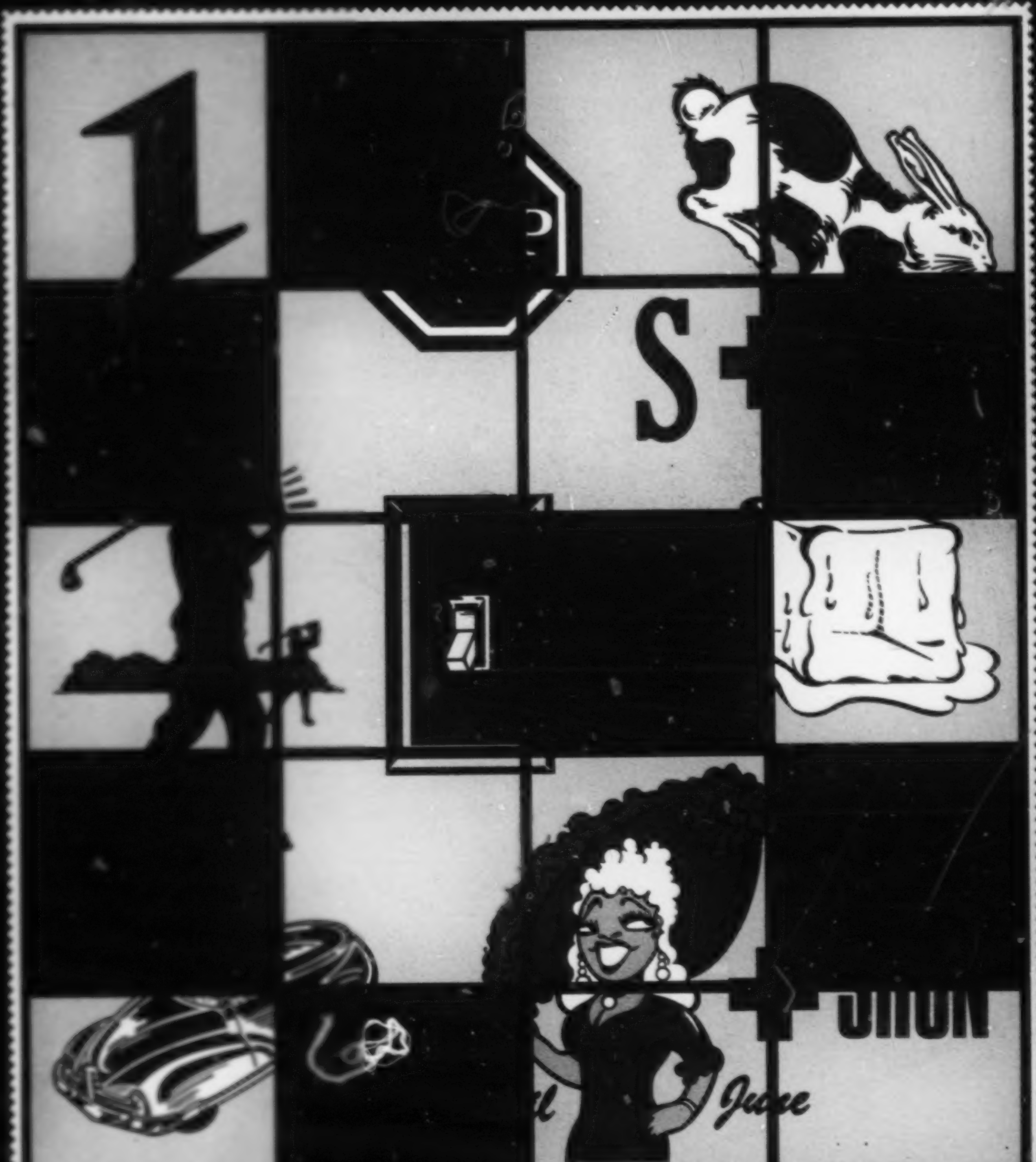

IBM'S OA PUZZLE

THE REAL COST OF OA.

EDS VS. XEROX AT GM

COMMON SENSE & NETWORK SECURITY

DATAMATION

FEBRUARY 1, 1985/$3.00 U.S.A.
VOLUME 31 NUMBER 3
This issue, 189,525 copies

FEATURES

22
IN FOCUS

Ease of use is important to hackers as well as to users. Lindsay L. Baird Jr. has some advice on "Sensible Network Security" to keep your network exclusive.

74
IBM'S OA PUZZLE

Linda O'Keeffe

It's not hard to figure out that IBM's preeminence on the desktop will help it take on the challenge of supplying computer solutions for all levels of the corporate hierarchy.

82
THE REAL COST OF OA

Paul A. Strassmann

Extensive resources are required to support an electronic workstation before it can be put to productive use, and the most costly elements of such support are not technological but organizational.

98
THE NETWORKING STANDARDS COLLISION

L. David Passmore

Users who don't plan carefully may get hurt in the clash of proprietary network architectures, but it looks as if SNA and OSI will emerge unscathed.

112
JAPANESE DP

Andrew Friedman and Joan Greenbaum

It can be the kiss of death in Japan to consider yourself a specialist in anything, even the most highly skilled computer jobs.

123
THE EVOLUTION OF SOFTWARE ARCHITECTURE

D. Verne Morland

While wafer-scale integration, voice recognition, and artificial intelligence will shape future efforts, we still have much to learn from the many mature products that form the basis of our industry.

NEWS IN PERSPECTIVE

32 **MANUFACTURING**
It's EDS versus Xerox at GM.

34 **SUPERMINIS**
DEC puts VAX on eight ICs.

40 **SOFTWARE**
Shanghai that software.
Glimmers of hope.
Bucking the tide.

55 **OVERSEAS**
Eagle eye on China.

64 **BENCHMARKS**

DEPARTMENTS

9 **LOOK AHEAD**
15 **LETTERS**
19 **EDITORIAL**

143 **HARDWARE**
149 **SOFTWARE**
153 **SOURCE DATA**
156 **ADVERTISERS' INDEX**
158 **MARKETPLACE**
160 **ON THE JOB**
165 **READERS' FORUM**

INTERNATIONAL 64-1

-2 **DESKTOP DECISIONS: IN SEARCH OF A SOLUTION**
-7 **DESKTOP CHOICES**
-13 **TRAPPED BY TRADITION**
-16 **CHASING WINDMILLS**

COVER ILLUSTRATION BY DOUG TAYLOR

The cost of automating office work is a matter of people, not machines.

THE REAL COST OF OA

by Paul A. Strassmann

Installing information technology in the office implies a much greater expense than just buying workstations. Extensive resources are required to support an electronic workstation before it can be put to productive use, and the most costly elements of such support are not technological but organizational.

The issue is not whether a cell of magnetic memory costs .001 cents or .000001 cents. The only valid way of looking at the economics of information technology is in terms of its utility.

There is a fallacy in the reasoning that somehow cheap computer power makes it very desirable to use a great deal of it. Investments in information technology must meet the same stringent criteria of justification as any other investment. Costs are important but secondary.

The most frequently used reasoning to justify purchases of information technology goes as follows: labor expenses are high and getting higher; computer expenses are low and getting lower; it then logically follows that one should always trade an expensive commodity, e.g., labor, for an inexpensive commodity, e.g., computers.

On the surface, this simple reasoning leads to inescapable conclusions. Let us examine it a bit closer by analyzing Fig. 1, a lucid representation of this point of view representing the payout ratio for a workstation in dollars per year.

The central message here is that a rapidly declining payout ratio makes the purchase of information technology increasingly attractive. At 11% of labor cost, it should be much easier in 1990 to achieve payoff from an investment than in 1970 when the payout ratio was 91%. Interestingly, the lowered threshold of financial pain for making office automation investments is not driven primarily by the 38%

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ILLUSTRATION BY ANDREA BARUFFI

Organized labor is becoming keenly aware of the negotiating leverage that mismanaged OA projects hand over to them.

reduction in the annual workstation expenses from $9,100 to $5,600. It is the increased inclusion of expensive professionals and managers in the labor cost, against which savings are counted, that makes the entire proposition so attractive.

The payout ratio is up because the labor costs considered eligible for automation are up by 500%. Management should not ask how information technology delivers the payoff. Management should ask how changed patterns of office work will deliver the promised benefits.

The economics of providing a workstation to managerial and professional personnel are far more complex than making a simple decision concerning the purchase of an electronic appliance or a machine tool (see Fig. 2). Less than 20% of the total first-year cost of equipping an administrator or professional with a workstation involves equipment depreciation. In the case shown in Fig. 2, equipment depreciation includes five-year amortization of an $8,000 terminal plus maintenance charges. Since an $8,000 device is not adequate to fully support office applications needed to aid the work of administrators and professionals, the personal workstation must draw on shared resources, like departmental files and high-performance printers for graphic output. The individual also must have access to communications controllers to connect to others in or outside the office building. Costs are also incurred in purchasing supplies such as paper, local magnetic storage disks, printwheels, cabling, and so on.

For a workstation to be useful, it must be connected to other workstations as well as to other networks. Telecommunications expenses of at least $1,500 include not only telephone line and instrument charg-

FIG. 1

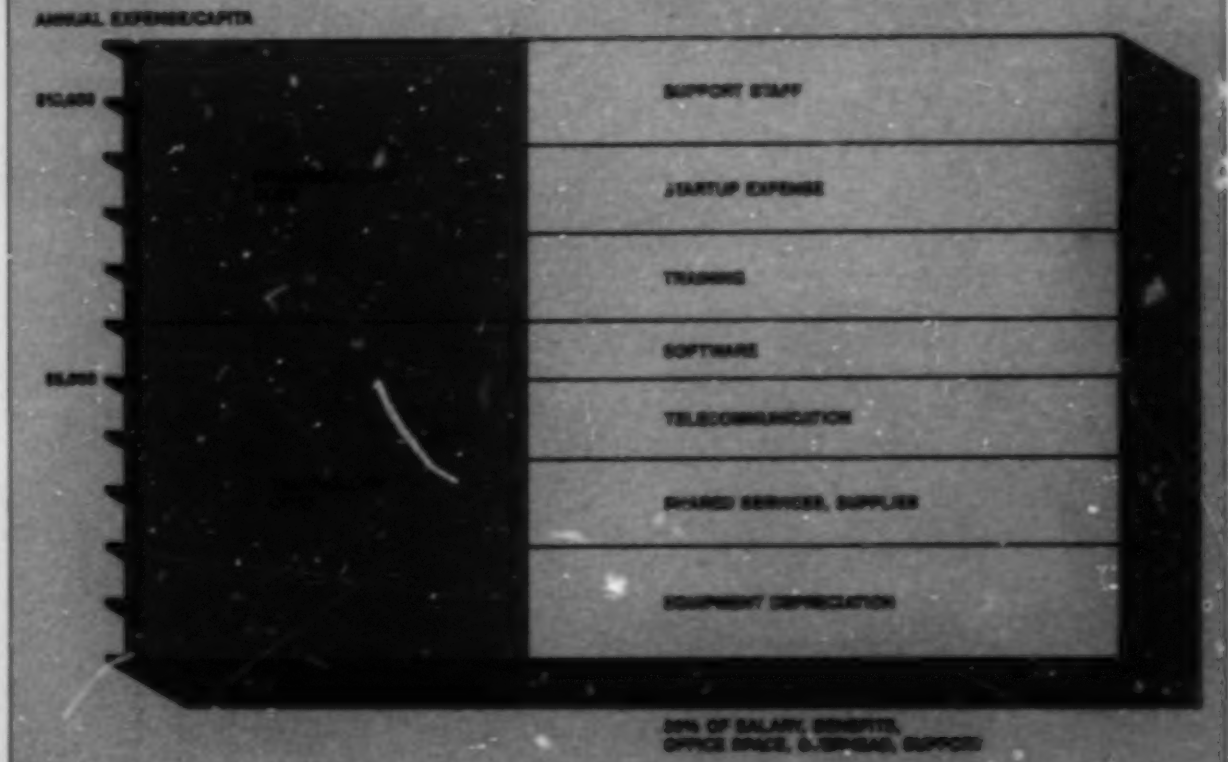
PAYOUT RATIO FOR WORKSTATION

	1970	1980	1990
Technology cost	$9,100	$8,600	$5,600
Labor cost	$10,000	$20,000	$50,000
Payout ratio	91%	43%	11%
Capability	Dumb terminal	Micro-computer	Desktop mainframe

SOURCE: INFORMATION SYSTEMS NEWS, MAY 16, 1983

FIG. 2

WORKSTATION FOR ADMINISTRATOR, PROFESSIONAL IN 1980



The cost of any activity that is labor intensive tends to rise faster than the general rate of inflation.

es, but also the rental of access devices, access charges to networks, and costs for using electronic mail services. Computer time charges for central computation and for central database services are included even though these can easily exceed the $200 to $600 per person per month that I have estimated.

Software purchases are amortized at only $1,000 per year. This assumes large-scale purchases shared among network participants. This estimate is also highly conservative. It is software that generates economic payback, not hardware. To create an environment characterized by high-performance people requires open-ended experimentation with a variety of software sources.

EXPENSES AS HIGH AS 12K

If, however, material improvements are expected in the productivity of managerial and professional employees, the $6,000 technology expense is at the low end of the range (for 1981-83 technologies) and could be closer to $10,000 to $12,000 per person if all shared network costs for central computing are fully allocated to each advanced user.

All of this presumes that no unusual expenses are incurred in improving office illumination, in rewiring the site for additional electric power, in increasing the amount of air conditioning, in providing improved acoustics in the office to reduce the noise generated by the new equipment.

If the workstation is installed in a typical manager's office with a standard desk, chances are that none of the furniture will be suitable for any extended stay in front of the vdt. An additional allowance of anywhere from $5,000 to $20,000 per person usually has to be made to take care of all of the office space and office furniture improvements.

Not all estimates of costs for proposed information technology projects are comparable. Some dollars are better than others. I have reviewed many budget proposals aimed at justifying investments in computer technology. They are usually backed up by elaborate feasibility studies to give them credibility. Pareto's Law (i.e., 20% of any cause explains 80% of any effect) certainly applies: 80% of the cost schedules of these studies are devoted to the most elaborate examination of computer equipment that will account for less than 20% of the total cost.

Shared services are given the barest minimum attention since they are considered fixed expenses. When considered at all they are treated as an estimated percentage factor applied to the costs of the purchases. Software and telecommunications estimates are rounded off to the nearest large number.

What receives the least analysis are the largest costs, those that are directly related to making the technology deliver its benefits. Office automation projects are dominated by user costs, or what I call organization costs.

Except for out-of-pocket fees for consultants, training, travel, and so forth, organization costs are for the most part disregarded because the technology is seen as an expense that is incurred anyway. Putting such costs down would presume that the extent of the users' involvement as well as the degree of the disruption of the business is known in advance. The preparation of office automation investment estimates involve even deeper biases. Computers, terminals, programming, and software can be isolated and classified within the conventional accounting system as investments. Users—people—are an ongoing expense. One does not mix investment numbers with expense numbers. The net effect is that management will probably never find out the actual costs of an information technology project.

In Fig. 2 I have understated the $5,000 organizational cost for the first year of placing an administrator or a professional in a computer networking environment. The estimated number is based on the assumption that perfection will prevail and that the project will succeed exactly as planned.

What contributes to organizational costs?

Initial training, which could take an average of three to six days, plus supplemental on-the-job training extending over a period of more than a month, to acquire operational competence can easily add up to $1,500 per person. The initial training cost must include the salary of the trainee as well as the costs of the trainers and of the training facilities.

HIDDEN STARTUP COSTS

Startup expense is conservatively estimated at $1,500 per person to cover a broad range of costs hidden in general overhead and in the lowered productivity that will occur during the transition from old methods. This figure includes inefficiencies in serving customers by new and unfamiliar means; job interruptions caused by unfamiliar new procedures; time spent in meetings with the peer group to negotiate changes in the handling of work; general management counseling; and the resolution of personnel questions affecting employee morale. The allowance of $1,500 is likely to be the lowest estimate that is acceptable, even for a well-run organization.

Two thousand dollars per person is budgeted for external support staff activities. The introduction of electronic workstations requires that consultants, central staffs, and all sorts of project support personnel become involved. Unlimited amounts of staff advice can be consumed in computerization of managerial and professional work. Organizational studies, methods analysis, security reviews, audit verification, and temporary assistance during conversion seem always to be needed in the transition from manual office work.

All of the above adds up to a sum of $11,000 for the first year's organizational and technology costs of bringing a typical administrator or professional into the electronic environment. This sum exceeds 30% of their annual full wage and salary costs. We must improve an individual's productivity by at least 30% just to break even. A 30% productivity improvement for administrators and professionals is hard to measure and, therefore, hard to find. This does not even take into account any of the risks, such as when runaway organizational costs obliterate any chance of favorable economic returns.

From a risk management standpoint, then, organizational costs are by far the most critical investment item. If a computerization project gets out of control, its technology costs are what remains controllable: they cannot exceed a well-defined limit. But under adverse conditions the organizational costs are not controllable because organizational costs do not have a recognizable upper limit.

In the event of a failure, such as in the case of a major job dispute, organizational costs will exceed technology costs by a large margin. Damage to customer service may be the greatest expense that will never show up explicitly in any investment analysis. Organized labor is becoming keenly aware of the negotiating leverage that mismanaged office automation projects hand over to them.

One of the most constructive ways of properly planning computer projects is to make data available about elements of organizational expense. For instance, the costs of systems support for handholding and for technical assistance can be determined from carefully monitored test installations. Realistic training time estimates are mandatory. There is a great deal of information that could be made available by pooling data about past training experiences under a variety of conditions. Such benchmark information would be valuable.

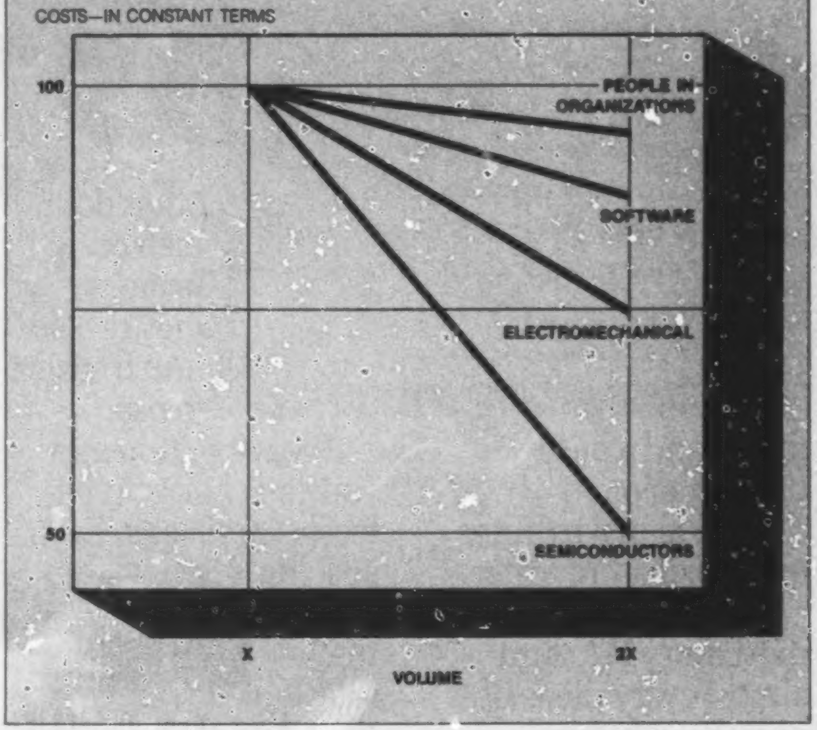
Sending employees to classes on company time at a company training center is the most expensive way of learning.

Most important, the risks of runaway organizational costs due to technical system failures cannot be tolerated. This is why information technology managers who are not risk takers will always prevail. It is in this environment that a conservative, but high-service, supplier will always receive the higher market share. The conservatives in the information technology race will always outlast even high-performance risk takers. Given enough time, the game of Russian roulette produces a certainty: death.

Management cannot delegate the task of choosing technology to information technology proponents, not to their own computer experts, and certainly not to equipment vendors. I am dismayed to see how frequently executives become excessive risk takers with computer projects on the assumption that spending money will deliver favorable results. The time is coming when investment conservatives will regain their confidence that this strange new electronic world is manageable. New methods will show that the fundamentals of good management apply equally to the economics of information work as to the economics of manufactured products. Using investments to generate improved profits should not be compromised by blind faith in the miracles of information technology.

FIG. 3

EXPERIENCE CURVE EFFECTS, BY ACTIVITY



BENEFITS ONLY IN LONG RUN

The cost of any activity that is labor intensive tends to rise faster than the general rate of inflation. Only accumulated experience in good use of capital investment can counter this trend. Due to heavy initial organizational costs, the benefits from most investments in information technology can be realized only in the long run.

There is a temptation to defer buying information technology to take advantage of the well-advertised declining prices of computer circuits. According to this theory, the current trend of a 50% unit cost reduction for semiconductors every time their production volume doubles should lead to a disappearing cost of hardware. This is not actually true because computer systems also contain electromechanical components, such as keyboards, printers, and disk drives. Systems also include software. None of these decrease in cost as rapidly as semiconductors. These trends are shown in Fig. 3.

Totally conservative reasoning that suggests deferral of investments in information technology projects is fallacious. As a matter of fact, such an approach will worsen the overall investment economics since the contribution of components, like memory and logic, represents less than 5% of the total cost of a system. Inflation in labor costs dominates everything.

The interesting economics of the various elements that make up a $10,000 per capita office automation budget reveal not only the overwhelming importance of organizational costs—made up entirely of labor expense—but also how varying rates of cost decline will influence the payoff from an office automation program (see Fig. 4).

Realizing a long-term payoff from information technology depends on the gains one obtains from people who have learned how to work more effectively. This takes a long time to accomplish. The gradual decline in organizational costs can be measured by the equivalent of the components learning curve. I call it the organizational learning or organizational experience curve. Time is the critical ingredient of success. One should never procrastinate in getting on with organizational learning unless labor costs are declining dramatically.

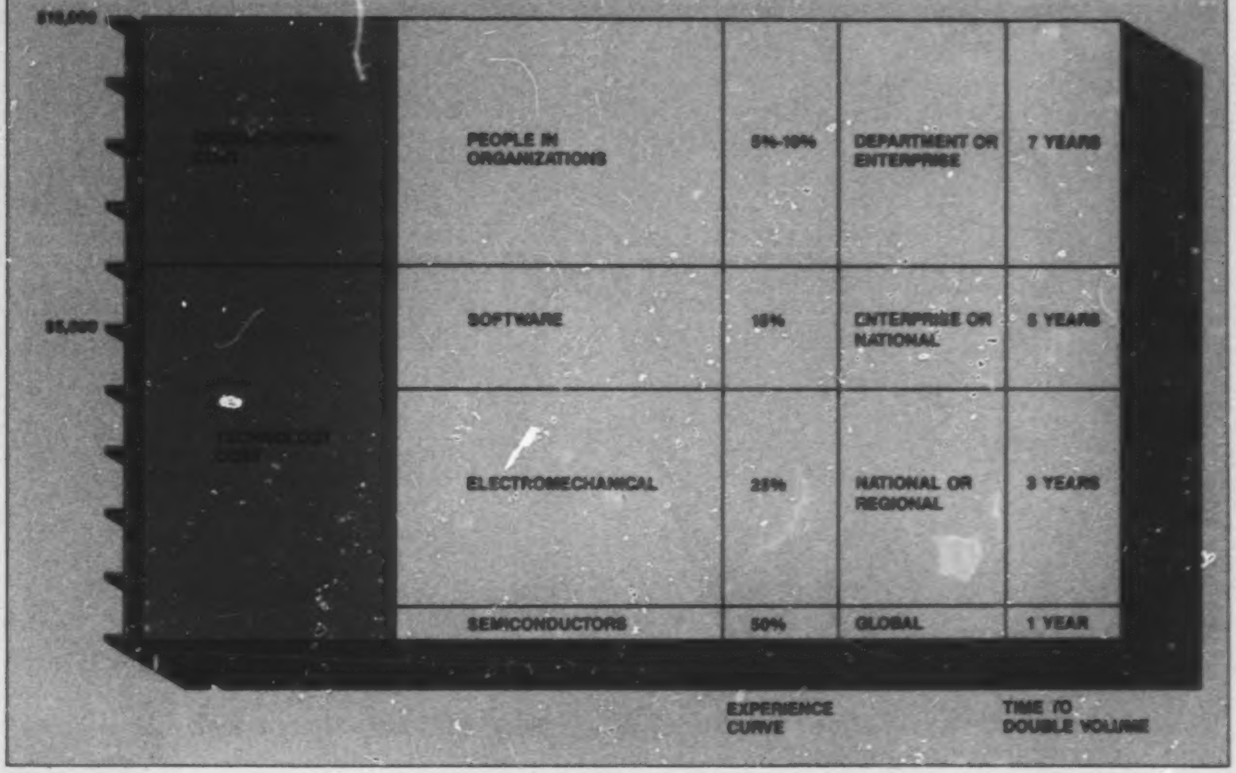
Because learning experiences are usually confined to isolated organizational units, such as to departments or plants, the organizational cost learning curve is inherently flat, probably not more than 5% to 10% per year. It is difficult to double experience if one starts small and remains small. Occasionally a project that has a national or even international scope is proposed as a way of accelerating the payoffs. These giant projects succeed only under the most unusual conditions. The essentially small, local scale of office automation projects dictates that the approach to implementation must be slow and gradual.

The rate of decline in organizational costs is also low because we are dealing with changing interpersonal relationships, with altering the division of labor, with reassigning office tasks and, frequently, with a subtle redistribution of power. For the first year's organizational costs to be minimized, organizational learning must proceed without any kind of organizational conflict. For these reasons, the prime responsibility of management on information technology projects is to cope with organizational issues rather than with technology issues.

To create the right environment for sharing organization learning, it will be necessary to create new standards for access to information sources.

FIG. 4

EXPERIENCE CURVE EFFECTS ON COSTS



MORE MONEY IN WORKPLACE

I think that to escape the squeeze between labor cost inflation and the limited ability of isolated organizations to transform themselves, the solution is to use greater amounts of learning capital in the workplace. This capital would be aimed at overcoming the effects of small-scale implementations of office automation by making it possible to bring about rapid sharing of best experiences from already successful sites. The solution to the problem of accelerated organizational learning lies in electronic networks, in electronic conferences, in on-line tutorials, and in on-line user support rather than in the traditional forms of classroom education, book learning, or improvised implementation assistance. If projects are proceeding too slowly, management should see to it that organizational learning, and not just technology, becomes transplanted in big doses through well-conceived imitation of the patterns of proven success.

My estimate of the expenses for the first year of automation do not include the elements that will increase with time: for every reduction in workstation prices there will be a corresponding increase in the use of remote services. Increased experience generates a greater volume of transactions. The volume of information has always grown as costs have come down. The costs of processing the increased volume has always exceeded cost reductions produced by better engineering. I see no reason why this phenomenon will not continue into the future.

I do not believe the current projections that the total costs of information technology, per person, can be expected to decrease. As a matter of fact, a tenfold greater growth in information industry revenues than the growth in information worker population is proof that per-capita expenses for information technology are growing very fast. Better information processing power, at lowered prices, will continue to be delivered indefinitely, but per-capita costs of information will soon equal payroll dollars. There will be no reduction in information technology expense as the result of decreased unit costs.

Organizational learning time can be dramatically reduced by an organizational design that balances decentralization with efficient use of shared resources. Shared databases, creation of industrywide cooperative projects, global division of labor, and lifting of regulatory boundaries are just a few of the many ways in which experience can be distributed to aid in purely local efforts. Organizational learning is also improved by giving employees incentives to acquire knowledge on their own rather than under company control. Sending employees to classes on the company's time at a company training center is just about the most expensive way of learning: laggards will be overstretched and potential overachievers will be held back in order to fit the standard teaching plan. Scheduling economics based on classroom capacity will also dictate that learning take place in the company of total strangers.

Until we have better insights into the behavioral aspects of people, organizational costs will be high.

Organizational learning involving the application of information technology is best accomplished at work, within the work group. The use of computers is a technical skill only to a very limited extent. It is increasingly a shared organizational capability. There is no better way to speed up organizational learning than for people who work together to learn together. This, of course, should not preclude individual remedial learning or individuals pursuing their own ambitions through supplemental education.

There are legitimate efforts to reduce organizational learning costs through standardization of all means of communication. There are equally valid reasons to enhance individual learning through customizing the devices that a person uses. I have seen many examples of applying forced uniformity in all hardware and software as a way to guarantee the sharing of learning experiences. There is a high price to be paid for such standardization: the pace of business is just too fast to tolerate uniformity at this stage of development. So far they have failed to achieve standardization in the functions of various computers.

SHARED LANGUAGE NECESSARY

To make it possible for organizations to share experiences electronically, the individuals must have at least a shared language. Database specialists, telecommunications protocol administrators, and software librarians are the agents for accelerating the distribution of information. To create the right environment for sharing organizational learning, it will be necessary to create new standards for access to information sources. It will be necessary to devise a completely new set of standards that will deal not with electronic pulses but with the linguistic habits of people who come from many different cultures, with people who have many different levels of skills in coping with the electronic medium.

Experience is not valuable to others if they cannot make use of it. Pilot programs, test installations, and experimental sites are popular methods for making cautious investments in computers. The most frequently given reason for this approach is financial limitations. A more realistic view is that managers are unsure of what they are getting involved with.

Small is beautiful, but breaking things up can also create a mess. If the prevailing management style is to partition learning among small and isolated enclaves, then the economic gain from the cautious approach will be minimal. Each site would build up its own cumulative learning. The experiment would have limited value because high startup costs would not be amortized over a larger base. Unless central management arranges for a careful evaluation and then for rapid dissemination of the results of these experimental installations, the principal benefits of the cautious approach will be found in reducing the costs of replicating the experiment. I doubt whether that is worth the effort.

These isolated experiments may actually decrease the overall experience level in an organization. Turnover among expert personnel is uncharacteristically high after the completion of isolated pilot projects.

On balance, I favor concentrated, well-focused, and well-funded office automation projects that have limited objectives but that can be rapidly expanded with success. Likewise, such projects ought to be quickly canceled if they do not deliver results. The primary objective of such projects is to rapidly make people much more productive.

It is striking how much more will have to be known about the behavioral aspects of people successfully relating to computers before the existing risks associated with investments in information technology will decrease. Until better insights are gathered, organizational costs will remain high. Until organizational costs become reasonably manageable, the rate at which we can expect information technology to become accepted must be revised downward from present extrapolations.

The economics of office work are dominated by labor cost. When introducing information technology, organizational expense becomes the most important element. This should dictate how the investment is made. Managing the risks of organizational costs rather than technological costs, in addition to stimulating organizational learning, are the primary roles for management. ®

"Harold's taking a course in art appreciation. Our accountant says it's time we started a collection"

CARTOON BY HENRY MARTIN

Paul A. Strassmann is vice president of systems applications for Xerox Systems Group where, among other duties, he assesses the effects of office automation. He was the chief computer executive for Kraft and General Foods, has taught at various institutions of higher learning, including Imperial College in London, and has published numerous articles on information management.

Because they're moved from department to department so often, most Japanese employees never become specialists.

JAPANESE DP

by Andrew Friedman and Joan Greenbaum

In Japan, companies hire the person, not the skills. In fact, it can be the kiss of death to consider yourself a specialist in anything, even the most highly skilled computer jobs. Many companies practice a formal system of job rotation for almost all white-collar workers to train entire staffs as generalists. This company policy also applies to data processing, though often with important modifications.

These findings emerged from a survey of data processing managers (DPMs) in Japan. Thirty-seven DPMs were interviewed face-to-face for between three and six hours. The survey is part of a large international project comparing dp departments in Japan, Europe, and America (see box). Striking differences between the organization of Japanese and Western computer departments include the following features:

- At 82% of the Japanese data processing departments, over 90% of the new recruits are hired straight out of high school or universities, though none of the Japanese data processing managers expected a computer science degree from a new programmer, compared with 19% in the U.S. and 14% in Europe.
- In fact, Japanese DPMs have very little control over the choice of new staff. In 57% of the firms, the choice of who comes to the dp department is made by the personnel department alone. No dp staff members participate in the decision at all. Such extreme lack of control over staff was found in only 2% of American and 8% of European data processing departments.
- Not only do Japanese DPMs have little control over whom they hire, but salary levels and promotion decisions concerning dp staff are often made outside of the dp department. In America, 18% of the DPMs said that decisions about salary changes were made outside dp, compared with 86% in Japan. Decisions about promotions were made outside dp according to only 7% of the American DPMs, compared with 36% of their Japanese counterparts.
- Job rotation schemes existed in 75% of the Japanese firms studied. Staff members were also rotated into and out of the dp department in 70% of the firms, though in two-thirds of these companies, dp staff were rotated more slowly than other staff.
- One result of these rotation schemes was the very high proportion of Japanese DPMs who came to their positions from some other department within the company. In the West, most come from a dp background, either from within the company or from outside. Of the Japanese DPMs, 56% came from nondp positions within the company, compared with only 15% in Europe and 11% in the U.S.
- The Japanese employ a high proportion of contract staff, but these people rarely get high status jobs in the dp department. Most often, contract staff are operators or programmers rather than systems analysts. Their specialized work carries low status in Japan, their earnings are usually well below those of the permanent staff, and they suffer social disadvantages because of not "belonging" to their client companies.

"Only generalists are preferred in this company," said one Japanese DPM. "Every year, the personnel department hires freshmen, some from universities and some from college. We in the computer department request so many new staff, but as for how many we can acquire, we can only hope. All are hired by personnel alone. No one from the computer department attends. Freshmen are trained by the personnel department for one month in general matters of the company. Then they are assigned by personnel to different departments."

It is a matter of general company policy throughout Japan to hire freshmen, that is, new graduates fresh from high school, college, or the university. Most of the DPMs (53%) reported that their company hires only freshmen, and another 29% reported that freshmen make up over 90% of new entrants. The model personnel policy to which almost all Japanese companies aspire is to hire new recruits as young as possible and mold them into the ways of the company for a prospective 30 or so years with the same firm. Recruits are not chosen for any specialized education, training, or experience that they may have acquired outside the company's control. Not one DPM expected a new programmer to have a computer science degree, though in 45% of the cases, some university degree was expected. General subjects such as law, philosophy, or economics are preferred from prospective white-collar staff (or salarymen as they are called in Japan).

COMPANY CONTROLS DP HIRING

New recruits in two thirds of the installations visited were chosen by the personnel department according to companywide requirements (see Fig. 1). Which of those recruits came to dp was also decided by personnel alone. In the other third of our cases, dp participated with personnel (or with a management committee in some smaller firms).

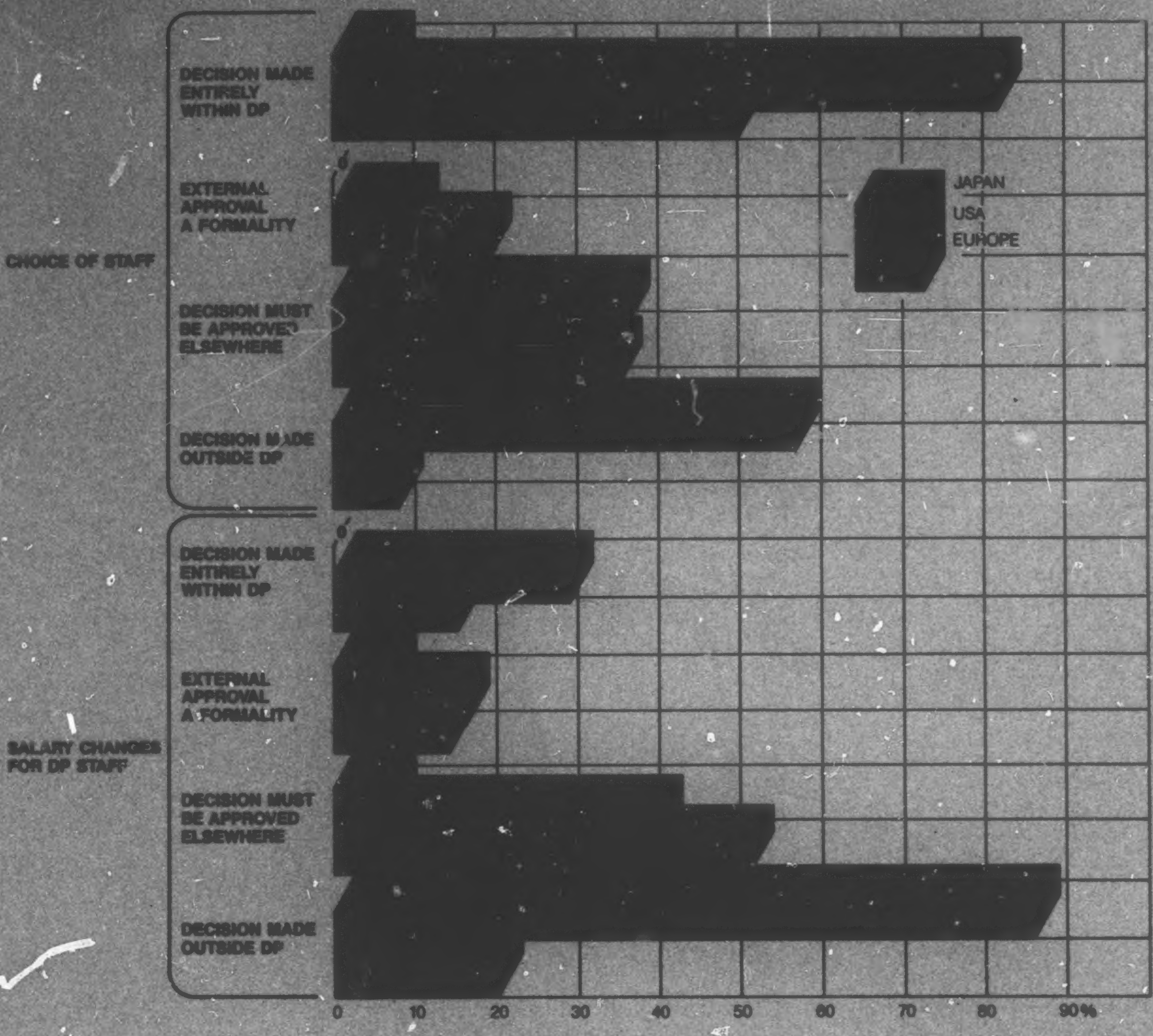
How does personnel decide which candidates to choose? In most cases, they select dp staff members according to which school or university they attended rather than what subjects they took. There is a strict and well-known hierarchy of educational establishments in Japan. Many companies maintain close links with only one university and recruit almost all new staff from that university. Personality and attitude are even more important factors governing selection of candidates. "Personnel looks for loyalty, harmony, and a fighting spirit, not technical skills," said one DPM.

As well as looking for the sort of people who will fit into the company culture, Japanese companies go to great lengths to shape new staff into the company mold. After they're hired, new recruits in all the companies we studied were given anywhere from two days to five months of general training (40% gave either two weeks or one month of general training). This was organized by personnel, and took place before the recruits knew which de-

ILLUSTRATION BY MEL FURUKAWA

FIG. 1

DPM'S CONTROL OVER DP STAFFING DECISIONS



NOTE: EUROPE REFERS TO THE SIMPLE AVERAGE OF NORWAY, SWEDEN, AND BRITAIN.

partment they'd be assigned to.

General training often involves psychological counseling or spiritual education along with vigorous physical exercises. This sometimes includes rally-type hikes, where recruits are broken into teams and are expected to learn the advantages of cooperation within the group, rather than competition. One DPM said the two weeks of training at their company was "very rigorous, with day and night training." Having gone through this initiation exercise, new recruits acquire a sense of community with the group recruited in the same year as themselves. Eventually this group will be scattered throughout the firm, but attachments formed on initiation often remain, much as students continue to socialize with their age peers even after they scatter to take different subjects. Often, members of the same recruitment year go drinking together. Such horizontal links by age across departments of the Japanese company can be invaluable for breaking down communication barriers between departments. It may mean that one of the greatest problems for dp in the West—good multilevel communication with users—is less of an issue in Japan.

The interviews in Japan usually began between 1 and 2 p.m. and lasted until 5 or 6 p.m. Many times, the team of interviewers would end up in a drinking spot after an interview. These bars, called akachochin, served food as well as drink. They were always appointed with a series of booths or small rooms for parties of up to five or six people. There we observed considerable multilevel communication among Japanese white-collar staff. Project leaders or DPMs often take members of their staff to akachochin after work. In addition, staffs from different departments who were in the same year at the same university regularly finish their long day at akachochin. People who belong to the same company-sponsored clubs or sports teams also go to akachochin with one another. Surprisingly, we also observed extremely high level executives together in booths with very junior staff members.

Sometime between 9 and 11 p.m., they roll out of akachochin and head toward one of Tokyo's myriad subway stations. Then they are literally stuffed onto subways that speed them out to the suburbs. Often, groups of three or four men, covering an age range of over 30 years, all with the same company pin, could be seen laughing and joking together like students, as they tried to prop each other up to match the roll and sway of the last subway of the night. During the week it is rare for the Japanese salaryman to get home to his patient wife before 10 p.m.

THE INTERNATIONAL SURVEY OF DPMs

The findings reported here are based on a survey of 331 data processing managers, including 37 from Japan, 199 from Europe (from Britain, Norway, and Sweden collectively), and 95 from the United States. In each country, senior level dp executives have been interviewed using a standard questionnaire. The interviews, often lasting more than three hours, were conducted by nationals of each country. The program is being funded primarily by the British Economic and Social Research Council, and the projects are being coordinated through the dp research project based at the Economics Department of the University of Bristol, England. Dp practitioners and researchers from the countries included in the program have formed the International Computer Occupations Network (ICON) to continue the research work.

Results from interviews conducted in the U.S. and comparisons with Europe were reported in two earlier issues of DATAMATION (see "Wanted: Renaissance People," Sept. 1, 1984, p. 134; and "The Challenge of Users and Unions," Sept. 15, 1984, p. 93). —A.F.

SOCIAL DRINKING SUPPORTED

Going to akachochin is not a haphazard activity. It is normal company policy to encourage different combinations of staff to finish their day at akachochin. This rather pleasant extension of the normal working day is but one method for achieving harmony, loyalty, and a fighting spirit. Another method is the way departments are laid out.

Every data processing department we saw was completely open plan. Not only were there no separate offices (except for meetings and sometimes for reception of guests), but there were no partitions or cubicle walls. Very few staff members spent the majority of their time sitting at their own desks. The casual impression of most departments was that the computer staff did not work very hard. This was wrong. Several data processing managers emphasized the need for the staff to cooperate informally to get work done.

Once in dp departments, recruits learn the skills they need on the job or they are sent on short specialist training courses run by hardware manufacturers or training organizations like the Japan Productivity Center. These computer skills do not often find their way onto the labor market. For one thing, skilled staff are less likely to be laid off by large Japanese firms than by firms in the West. Japanese managers spend considerable resources developing the loyalty of staff toward their fellow employees and especially toward the company. They are less likely to respond to short-term market depressions by laying off staff because of the impossibility of replacing loyal cadres quickly when business improves.

Even if individuals are dissatisfied with the company, they cannot easily leave because there are relatively few attractive places for them to go. The larger companies pay the best wages, but they prefer to hire freshmen. Even smaller companies will prefer second-rate fresh graduates to people who have been socialized to be loyal to some other company (or people who show they are resistant to such pressures by voluntarily leaving a large company).

This is a problem for small companies. Until quite recently, large Japanese companies have grown very quickly, sucking up all the fresh graduates. Also, the number of freshmen available has begun to fall off because of a long-term trend toward smaller families in Japan. Smaller firms have found it difficult to recruit young staff. Some have been forced to take experienced staff who have left other firms, but usually all they can get are people who have left other small firms. Once hired by a large firm the pressures on a salaryman to stay there are compelling.

Salaries are closely tied to age in Japan. This is particularly true for large firms. For example, men in their early 20s working in the finance and insurance sector earn on average 14% more in large firms (more than 1,000 employees) than in small firms (10 to 99 employees). Men in their late 20s earn 27% more in large firms. By the time freshmen have acquired skills that might be marketable, they will have to give up a high salary in a large firm to go to a small firm that takes experienced recruits. This is likely to mean much worse fringe benefits as well as lower wages and poorer promotion prospects. This ties people closely to the company.

Within such large companies, the knowledge that he is likely to be there for the whole of his working life alters the Japanese salaryman's attitude toward his company, his colleagues, and any skills he may acquire. He does not go to a large company to learn a trade or a profession; instead, he enters a long-term social network.

FAMILY IMAGE NO JOKE

The image of the company as one big happy family is often viewed as a rather transparent piece of top management strategy in the West, but in Japan the image is much more convincing. In the West we hear of Japanese workers singing the company song first thing in the morning and listening eagerly to pep talks from supervisors. We think of it as a joke, or at least as evidence of how easily Japanese workers are duped. But the large companies provide something close to lifetime employment as well as certain all-important welfare provisions (such as health insurance, unemployment insurance, and pensions) that are available on only a limited basis through the Japanese government. Under these circumstances, it is not surprising that most dp staff regard their time in dp as just one stint in a part of the company, rather than an opportunity to acquire a valuable skill.

Besides hiring generalists and giving them general training at initiation, most large Japanese firms frequently rotate staff among departments. Three quarters of the DPMs interviewed said that a system of job rotation was a general policy for salarymen in their company. The frequency of rotation varied from every two to three years to every five to six years (54% of those that said they rotated staff did so every three to four years). Spending only three to four years in a department and then moving on to another encourages salarymen to view their future as depending on the company as a whole, rather than on departmental specialisms. Salaries and promotion in Japanese companies depend on a complex formula that includes number of years with the firm, evaluation by supervisors, and the rate of job rotation. Young men on their way to the top are those who are rotated fastest. The ability to get along well in many different departments and the widest possible knowledge of the company are the keys to success. Herein lies a big problem for dp staff and a danger for Japanese companies.

Most would admit that it takes a good two to five years for a programmer to become reasonably proficient. Most Western DPMs look for at least two years of experience from any candidate for a programming job above trainee. Therefore programmers will only just be pulling their own weight after working in dp for three to four years. If they are then rotated out to some other department, most of the benefits of training them to program will be lost.

In fact this problem is recognized and tackled in most Japanese dp departments. Three quarters of the departments in companies with job rotation schemes either rotated dp staff more slowly than other white-collar staff (67%) or did not rotate dp staff out of data processing (7%). On average, dp staff were being rotated every seven to eight years. While this goes some way towards solving the problem of losing dp skills, it creates other problems.

The problem is, perhaps, most acute for the DPM. Many times, the DPM is not a computer specialist (see Fig. 2). Fifty-six percent of the Japanese DPMs interviewed had come from nondp positions within the firm, (compared with only 11% in the U.S. and 15% in Europe). Most of these DPMs were high fliers in the company, rotating quickly into and out of dp on their way up the company ladder. Only 6% of the Japanese DPMs interviewed had been in that post for more than five years, compared with 34% in the U.S. and 36% in Europe.

Technical specialists in Western dp departments are often encouraged to develop their skills by DPMs who have risen from the ranks of dp. In Japan, it is difficult for the DPM to give this sort of technical guidance to young staff members because he himself lacks a dp background.

Slower rotation of ordinary dp staff hurts their chances of promotion and generally slows down their rate of salary increases. Even more important, dp staff members become specialists where the clear company culture is to prefer generalists. The social grouping circumscribed by the walls of the dp department becomes relatively more important than others. Dp staff risk losing their ability to see problems from a companywide perspective. They see changes in company policy in terms of the effects on dp and risk becoming defensive and inflexible. Fostering harmony, loyalty, and a fighting spirit with them becomes more difficult. They are in danger of becoming marginalized.

It is easier to establish harmony among a fairly homogeneous group of people. Apart from achieving homogeneity by choosing staff from a similar background (the same university) and molding them together in a similar way (general training by personnel departments, rotation schemes), another way is to carry out only similar work tasks within the company. This means farming out specialized work to suppliers or to contract staff.

Contracting out programming work is the solution that many Japanese firms have found. Half the companies interviewed had contracted out at least part of their programming and operations work. Some had contracted it all out. In these firms, the dp department contained only systems analysts (called systems engineers) who wrote specs for contract staff. Contracting work out can be thought of as another way of achieving harmony, loyalty, and a fighting spirit.

CONTRACT STAFF LOSES OUT

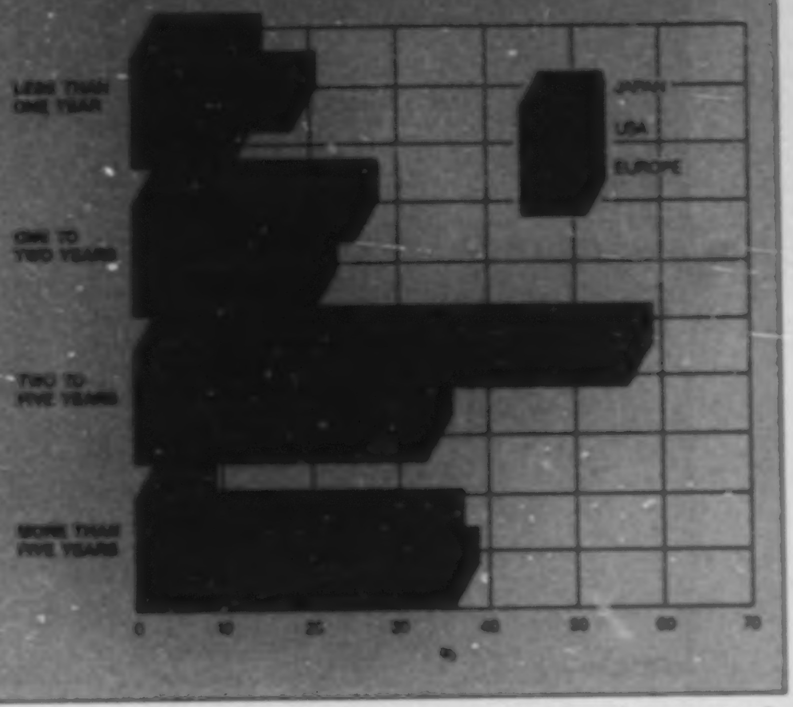
Contract staff are not hired as individuals; instead, work is subcontracted to a specialist company. This company then sends its staff to the customer. Staff from the subcontractor will work at the customer site for long periods. In fact, some examples were cited of subcontractors with 10 to 14 years on site. The prices paid to subcontract firms are often very low and this means that the people working on site from the subcontracting firm will be paid less than the permanent staff they work beside. Far worse than this is the social disadvantage in Japan of working for many years at a company to which you do not belong. The strong culture that binds employees to the company does not extend to contract workers. The advantages of sociability, company-sponsored sports facilities, outings, and after-hours drinking sessions in akachochin are not enjoyed by the contract staff. Nevertheless, they are subjected to the same pressures as permanent staff. On the occasions when interviews continued after 6 p.m., it was rarely observed that any of the dp staff—regular or contract—had gone home yet. When people eventually headed out to akachochin, contract staff didn't go.

The people who work for subcontract software houses were often spinouts from dp installations in large firms. They left the relatively comfortable embrace of a large company to pursue their computer specialities or because they did not fit into the company culture. Many, as in the West, quit because they believed they would earn more money in a smaller software house. Often, this is initially correct, especially if they left their original company after only three or four years in the dp department. Up to the age of about 25, wages are quite low even in large firms and the differential between large and small firms is small. It is only later that the disadvantages of working in a small firm in Japan became apparent: the lack of welfare provisions and a flatter age-wage profile.

Overall, the picture for specialized dp staff in Japan is problematic. Those who stay in dp in large companies have fewer promotion prospects than other white-collar staff. For those who spin out to a software house, the chances are good they will work for long periods at a customer site without the desirable social advantages of belonging to that company. Those most likely to succeed work for large companies, but stay in dp for only a short time. ●

FIG. 2

HOW LONG HAS THE PRESENT DPM BEEN IN POST?



Andrew Friedman teaches economics at the University of Bristol, England. He is the principal investigator of the study reported on in this article and author of the 1977 book, *Industry and Labour* (available in the U.S. through Humanities Press, Atlantic Highlands, N.J.) as well as several articles on work organization in computing.

Joan Greenbaum is an assistant professor of data processing at LaGuardia Community College in New York (CUNY). She is author of the book, *In the Name of Efficiency* (Temple University Press, Philadelphia, 1979), and often lectures on technology and social change.

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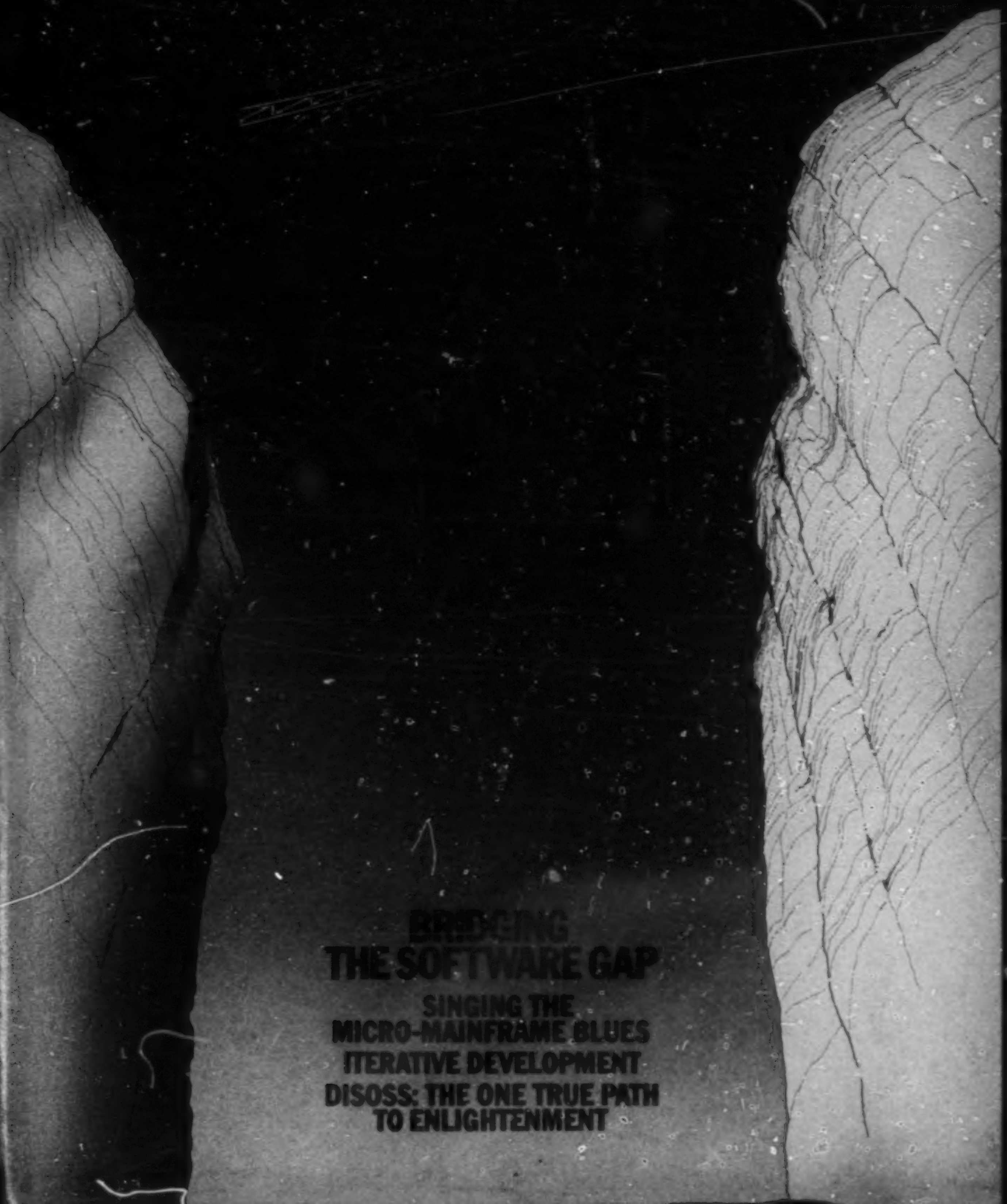

BRIDGING THE SOFTWARE GAP

SINGING THE MICRO-MAINFRAME BLUES

ITERATIVE DEVELOPMENT

DISOSS: THE ONE TRUE PATH TO ENLIGHTENMENT

DATAMATION

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FEATURES

30
IN FOCUS
Is it a savior for hard-pressed programmers or a trumped-up lab curiosity? Whatever it is, asks R. Emmett Carlyle, will buying and selling the new reduced instruction set computer be a "Risc-y Business?"

84
CLOSING THE SOFTWARE GAP
John W. Verity
Concerned with the common acceptance of programming errors, and with the effect that has on industrial development, eminent theorists are touting mathematical methods as the most effective programming tools.

92
ITERATIVE DEVELOPMENT
Ronald L. Cullum
Command-level languages can be used to develop high-quality systems in substantially less time.

102
MEASURING APPLICATIONS DEVELOPMENT PERFORMANCE
Steve Drummond
The function points technique provides the applications manager with a measurement strategy that has meaning both within and without the department.

112
DEVELOPING PC APPLICATIONS
David Dee
As the microcomputer shifts dp out of the shop and onto the desktop, applications development becomes personalized.

120
DISOSS: THE TRUE PATH TO ENLIGHTENMENT
In the beginning was the computer. But office automation was without form, and void. And the spirit of Blue moved upon the face of the office, and said, let there be DISOSS. And it was pretty good.

127
MESSAGE FROM MANAGUA
Marcy Darnovsky
One member of a kind of Computer Peace Corps mission to Nicaragua tells what it was like providing technical assistance in a country at war.

134
A NEW VOYAGE FOR COLUMBUS
Paula J. Stevenson
Ohio State University successfully expanded its computing from one centralized center to include a number of separate departmentally owned facilities, each with one or more computers.

NEWS IN PERSPECTIVE

40 **PROCUREMENT**
What price ITC?

43 **MAINFRAME LINKS**
Micro to mainframe blues.

60 **OFFICE AUTOMATION**
Last chance for NT.

64 **SOFTWARE**
Bean counters attack!

80 **BENCHMARKS**

81 **WORLD WATCH**

DEPARTMENTS

13 LOOK AHEAD
18 CALENDAR
23 LETTERS
27 EDITORIAL
141 HARDWARE
149 SOFTWARE
156 ON THE JOB
159 MARKETPLACE
161 READERS' FORUM
164 ADVERTISERS' INDEX

OEM SUPPLEMENT 148-1

-3 BEEFING UP SOFTWARE
-11 AN INSIDER'S GUIDE TO AT&T IS
-21 WINCHESTER WITCH DOCTORS

COVER ILLUSTRATION BY ANDREA BARUFFI

Begging your pardon, sir, but there are several companies that say '85 isn't going anywhere.

"I just don't see it having an impact," says the MIS vice president of a New York investment house. "If repeal were going into effect on Dec. 31 and you have your board of directors' approval to purchase a system, you might make the buy on Dec. 31 to get the ITC. But I doubt very much anyone would rush a proposal to the board just to get the ITC. I'd rather get it right."

And Harold Baeverstadt, corporate director of information systems at Sundstrand Corp., Rockford, Ill., says, "We're not going to buy more mainframes anticipating repeal. We're going to make our decisions based on need. If we anticipate needing something in January or February, we might move it up to December" to use the ITC. "But we're not about to stock up," he adds.

"We still need equipment to get the job done," says Ed McConville, controller of the Consumer Foods Division at General Mills. "I'd still like to think we would move ahead with our acquisitions. But it probably means marginal acquisitions will be scrutinized more closely and some of them will not be made."

What probably will be made is more money, especially by lessors. Under the current ITC, a lessor has two choices. It can forego the ITC advantage by passing it through to the lessee, with the lessee having to pay for the gift in the form of higher lease rates. On the other hand, if the lessor chooses to take the ITC itself, that manifests itself in the lessee's lower rate and inability to take the ITC. With no ITC, it's not exactly clear what will happen here. Users will suffer, but lessors may not necessarily gain from that.

"There will be a decline in the leasing market," says Paul Oosterhuis, counsel for the CBEMA tax committee. "It's going to be significant. Stretching out the ACRS and repealing the ITC has to hurt the lessors."

Yet "the single biggest impact on prices will be the repeal of the ITC," says Frank Chatrier, executive vice president of financial services at CMI, a leasing company less dependent on ITC transactions than it used to be. Some of the company's leases use "income funds," a capital-raising technique almost entirely independent of the ITC.

"It's going to increase lease rates by 10%. What used to cost 92 cents will cost $1. There's going to be a permanent change in the pricing structure which will be detrimental to users. Budgets will be impacted, too. Everybody will be paying 10% more. The decision matrix for dp guys to acquire equipment will be much tougher."

One leasing company thinks the bonanza begins at home. "This would be a benefit for leasing companies and detrimental for users," contends Bob Snyder, vice president of Comdisco, Rosemont, Ill. "If they take away the ITC, we'll need a dramatic increase in lease rates to make up the yield. I think that will happen, because customers are still going to need equipment. Business will decrease only if there's a decrease in demand for computers. And that's not about to happen."

None of this may happen. Then again, all of it may happen. The whole affair probably depends on the President. If he pushes hard, the proposal lives. If he walks away, it dies.

"Reflexively, people's first reaction is that it can't pass," a knowledgeable House staffer says. "But maybe it can. I just don't know if these guys can vote against their own interests. I'm also not sure that voting to repeal the ITC is against their best interests. If they lose it and the ACRS here, they'll just go offshore. They'll get the credit in that country, then come back here and be taxed at 33% [the proposed corporate rate].

"If the whole package falls apart, all bets are off. Then we'll just go back to what we've been doing for the last three years—fighting like cats and dogs, cutting a little here and there."

So much for reform. ●

MAINFRAME LINKS

MICRO TO M'FRAME BLUES

Despite all the hoopla, most dp managers are still looking for an acceptable micro-to-mainframe link.

by Paula S. Stone

About micro-mainframe links
they'd read in the press.
Upon implementation,
they'd found only a mess.

The trade press is glutted with products claiming to be the gateway to transporting dpers into a brave new world characterized by trouble-free and secure micro-to-mainframe connections. However, as Carleton Corp., Boston, put it aptly in its Christmas poem takeoff on Clement Moore's *A Visit from St. Nicholas*, the reality is not quite as pleasant as the promoters would have data processing managers believe.

ERDEI OF HUGHES is replacing the 3101 emulator with Relay because of its superior file transfer and switching capability.

While many companies are prepared to make the heavy investments in both dollars and time to implement a suitable micro-to-mainframe link, the currently offered packages lack polish, a wide variety of features, and a reasonable price, according to a new mail survey and a random telephone poll of DATAMATION readers. Now that the IBM PC and its plug compatibles are the mainstays in the offices of corporations around the world, the need to go beyond standalone units is paramount. And though linking these micros to mainframes is at the top of the list of dp managers' priorities, most are waiting patiently for the market to stabilize.

The experience of James Bird, director of information services of $5.6 billion General Mills Inc., Minneapolis, is a typical result of current conditions. "I've been wanting to make micro-to-mainframe investments for the last year," he says. "We've found that while there has been a lot of press and talk about micro-to-mainframe communications, there don't seem to be many people who are doing it successfully. My reaction was one of disappointment, particularly when you relate it to the number of products that seem to be available."

Bird's observation seems to illustrate the statistics of DATAMATION's 1984 survey on micro-to-mainframe links available as of December. Roughly a quarter, 27.1%, of the 642 respondents are currently using a micro-to-mainframe link; the highest concentration is in manufacturers of durable goods, 35.6%, and consumer goods, 29%.

The interest in advanced mainframe-based products has been less than enthusiastic: only 22% of the affirmative respondents are using products from the leading mainframe software suppliers. On-Line Software International Inc., Fort Lee, N.J., with 8.6% of the installations, and Cullinet Software, Westwood, Mass., and McCormack & Dodge, Natick, Mass., with 3.4% each, head the list. Most respondents are using terminal emulators, such as the Irma board products from Digital Communication Associates, Norcross, Ga.

Looking at the subset of dp centers for the Fortune 1,000 industrials and Fortune 400 financial and other services sectors, the percentage using micro-to-mainframe links increases sharply, to 43%, but the level of commitment to the big packages from the big vendors is almost identical with that of the overall population, 20.2%.

Such percentages were not surprising to officials at Cullinet and On-Line Software. Cullinet president Bob Goldman states that "while a lot has been said about micro-to-mainframe links, the products are just becoming available. Dp departments are beginning to set up their environments to use them."

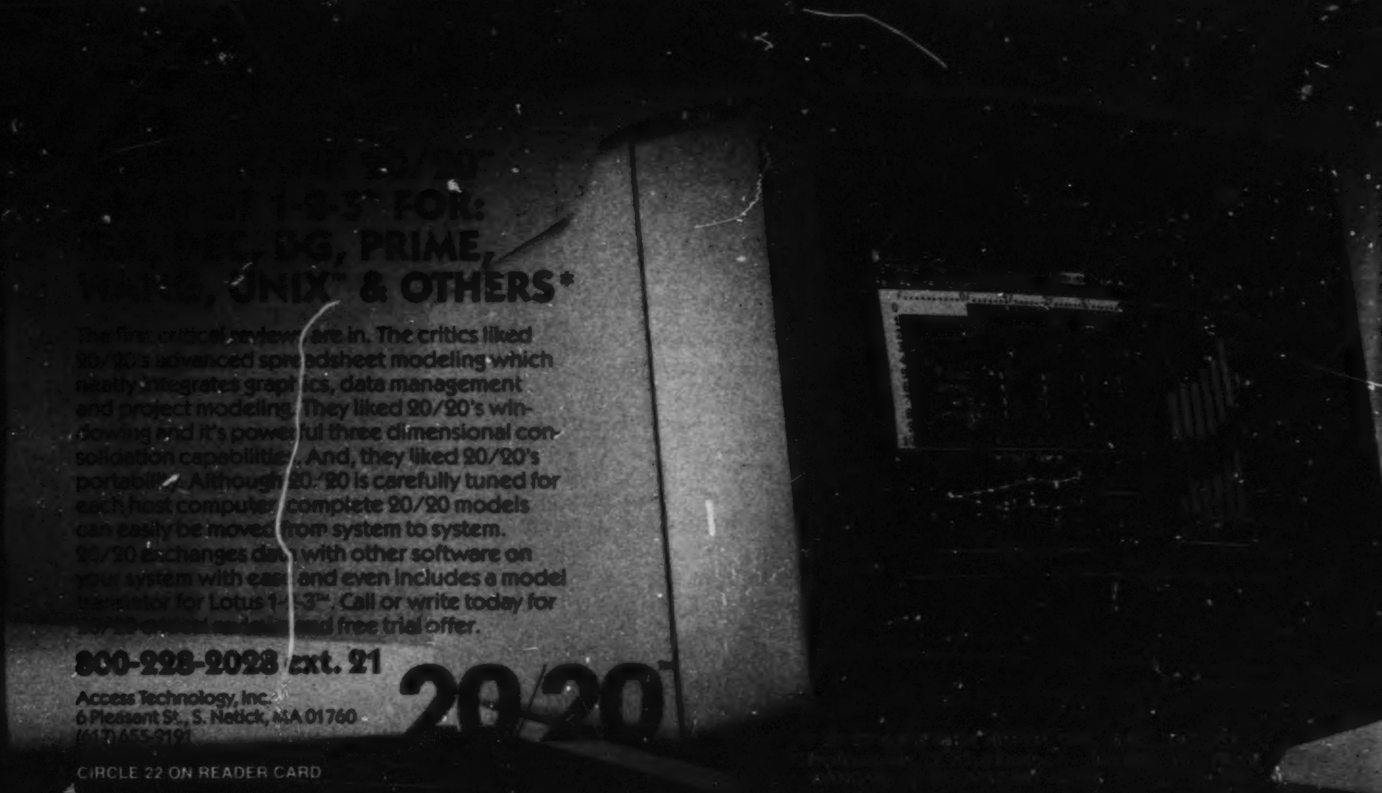
Jack Berdy, president of On-Line Software, is more pragmatic. "The links are getting more attention and lip service than the number of people using them," he concedes. "Large companies with lots of micros are standing back and using study groups to analyze the data before making a commitment. Conflicts of interest and questions about security also slow the process. Smaller companies usually don't need it or don't know how to use the links yet. When they do they want to be able to move a file to a pc."

Berdy predicts "more implementation and commitment to a direction," i.e., product and/or product line, later this year or early in 1986. Berdy's optimism may be short lived, however, since dp managers frequently exhibit a conservative attitude toward complex network products. Frequent surveys over the years, for example, indicated that 20% of dp managers were interested in buying local area networks, yet the percentage actually using a LAN remains 10%.

FIG. 1

PERCENTAGE OF MICRO-TO-MAINFRAME USERS
(BY VENDOR AND FIRM SIZE)

	ALL COMPANIES (174)	LARGE COMPANIES (114)
ADR	1.7	1.8
CINCOM	1.1	0
Cullinet	3.4	3.5
Informatics	.6	0
Information Builders	2.3	2.6
McCormack and Dodge	3.4	5.3
MSA	1.7	1.8
On-Line Software	8.6	7.9
Other	78.7	79.8



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Typically, a cautious attitude translates to intermediary steps to satisfy current needs while waiting for the market to mature.

As Bird of General Mills explains, "We have looked at a wide range of communication packages and found the area to be a very confusing one. We think many products are being sold today that on the face will provide micro-to-mainframe communication. But, when we look at them, we find there are a lot of problems and deficiencies, whether in terms of integrity or functionality.

"It is a very dynamic area and at this time, apart from one or two products that tend to be very expensive, is not one that enjoys either a high reputation or a good track record," Bird concludes.

The General Mills short-term solution is Passport from Datalex Co., San Francisco, and Kermit, designed at Columbia University and sold by Kermit Distribution, New York. They are typical of what dp departments are looking for in terms of function. According to Bird, Passport is "reasonably priced," provides an "acceptable level of user friendliness," and transfers spreadsheet files from micro-to-micro or to a mainframe. Kermit offers more potential for flexibility than Passport, boasting macro programming and other capabilities, he adds.

Only 22% of the respondents are using micro-to-mainframe products from the leading mainframe software suppliers.

Next to functionality, cost is another big factor for dpers. Some packages General Mills looked at were $40,000 for mainframe software and $1,000 for each micro. "When you are looking at 50 entities, that's a big investment, relatively speaking, in an environment that is still very young and developing," says Bird. "We recognize that and want to secure products that provide the basic level of functionality, but don't incur the level of investment that indicates we are going to be with the product for a long time. We don't think that is going to be the situation. We think there are going to be significant developments along this area in the next one to two years and we don't want to sink a lot of money into this area at this point."

Dpers also point to overambitious and inflated advertising as reasons for postponing purchases. A common complaint of dp managers contacted by DATAMATION is that many products just don't perform as suppliers claim. Early announcement of products or product enhancements lengthen the time before corporations will purchase. Dpers feel the products aren't fully tested before they are announced and the availability date is uncertain. If an MIS manager decides on a particular product and then the next version with enhancements is announced, he or she may wait until the enhanced version is available.

Approaches and experiences with suppliers vary considerably. On-line Software announced its Omni-Link micro-to-mainframe link in April 1983, to be delivered by December. The deadline was met.

On the other hand, Cullinet's Information Database (IDB), which was announced in January 1984, was scheduled to complete beta testing at the end of January this year. That didn't stop the company from mailing hundreds of demonstration disks to magazines months before beta testing was completed, or from selling about 150 copies in 1984 at $75,000 each. Goldengate, Cullinet's integrated pc package that can link to its IDB, was introduced in June, selling about 3,000 copies in 1984, claims Goldman.

Goldengate's reception is mixed.

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A prominent personal computer magazine raved about it in one issue, and two months later conceded it had significant flaws. Many dpers have not heard of it or thought it too expensive at $795 per unit for each pc—discounts up to 50% are available—in addition to the $75,000 for the mainframe software.

David Ferris, communications consultant and chairman of the San Francisco-based Ferrin Corp., says that "Cullinet has not understood the nature of the micro market right now. We do not recommend Goldengate, which was not developed by a central organization such as dp, but rather from an end-user pool.

"We have also examined some of the products and found them below par," continues Ferris. "We think Cullinet is a good company and you can expect some good things from them, but so far they have not developed an adequate strategy for handling the micro end of the market."

According to Ferris, simple file transfer is the most common application of micro-to-mainframe links. Dpers are also using micros as data entry devices, such as those sold by the Four-Phase subsidiary of Motorola based in Cupertino, Calif., and by Mohawk Data Sciences, Parsippany, N.J.; terminal emulation packages for asynchronous/synchronous communication; and some electronic mail.

For simple file transfer, the Hayes Smartmodem and Smartcom II software packages are the most popular. Other packages include BLAST from Communication Research Group, Baton Rouge, and Relay from New York-based VM Personal Computing.

Cray Research Inc., Mendota Heights, Minn., builder of large-scale scientific computers, uses BLAST to download programming code from a large number of pcs housed at a central location to remote sites. BLAST's error-checking capabilities are essential.

"Large companies with lots of micros are standing back and using study groups to analyze the data before making a commitment," concedes Berdy of On-Line Software.

"We've been using BLAST for about nine months," says senior program analyst John Badger, "and have never seen any bad data or bit. It also takes less time to transfer data than Crosstalk, the package BLAST replaced." BLAST for mainframes begins at $1,250. Each micro is $250 and discounts are available.

Half of the dpers contacted in a random telephone poll use VM Personal Computing's Relay/VM and Relay 3270, bundled together for $6,995, for file transfer between IBM mainframes and IBM Personal Computers and plug-compatibles. One new user is Hughes Aircraft Co., Long Beach, Calif., with about 1,000 pcs, which include "several hundred HPs, DECs, and others," according to Mike Erdei, associate director of systems development for the Communications and Data Processing department. Some of these are linked to the IBM 3084 using Forte boards or 3101 emulators. Forte was developed by Forte Data Systems Inc., Santa Clara.

Hughes is replacing the 3101 emulator with Relay because of Relay's superior file transfer capability and ease of switching between local pc and terminal session modes.

Stevan Pettit, a 20-year dp veteran and senior programmer analyst for Union Carbide in Charleston, W.Va., has been using Relay for one and a half years with IBM mainframes and the 1,000 plus personal computers located in the U.S. and Canada. The pcs include models from IBM, TI, Wang, Compaq, and Apple. Relay 3270 for pcs provides a high degree of functionality and ease of use, says Pettit.

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PETTIT OF UNION CARBIDE says there are lots of limitations using the 3270 boards, such as the on type and size of file transfer.

"Relay has lots of nice little features incorporated into it; the on-line help and vendor support are excellent," he continues. "Its full-screen simulator allows a user to dial the mainframe over a regular asynchronous line and operate as a 3270 terminal. We also support it so heavily because it is the only package that we know of that will allow a file transfer between our CMS system and the pc that will do binary file transfer with error checking."

Union Carbide also uses Forte, IRMA, and Tempus emulator boards in its pcs; it recently dropped the Tempus emulator board package from Micro Tempus Inc., Montreal, due to inadequate support. The Forte board is slightly faster than IRMA, reports Pettit, and there are lots of limitations using the 3270 boards, such as the type and size of files. It is working around this by using Relay and the boards together.

Harvey Shlasky, manager of the management consulting department for the Big Eight accounting firm Deloitte, Haskins & Sells, Los Angeles, claims his experience using Relay and BLAST has been "fair to middling with pretty much the same problems."

The problem in making the connection between micros and mainframes isn't just hardware and software. "One problem is that the users don't define their requirements properly. They just kind of throw in a product to try it out without doing a thorough requirements definition before they actually start the effort," Shlasky comments. "The result is that they are typically frustrated."

The suppliers have their work cut out for them, with many eyes watching them. Will they dance or get cold feet, dooming dp managers and their pc end users to terminal emulation forever? ●

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FEATURES

24
IN FOCUS
Home furnishings and apparel mart developers are setting up permanent computer showrooms that offer the advantages of a trade show without the frenetic pace, reports Karen Gullo. But as "Computer Marts Multiply," will computer sales?

76
INSIGHT INTO ON-SITE TELECOM
Lawrence Bolick
Recent announcements by AT&T and IBM offer a view of the telecom architectures likely to dominate the office for the remainder of the century.

Probable Post, 2:35

96
HANDICAPPING LANS
Martin Pyykkonen
The smart money's on local network technology. Here are some tips on the field.

106
QUALITY ASSURANCE
John Connell and Linda Brice
Everybody talks about quality, but nobody does anything about it. Until now: a new program fosters creativity, speeds development, delivers software with fewer defects, and is more maintainable and flexible.

119
THE QUEST FOR QUALITY
Joseph L. Podolsky
Current tools are the worst form of quality assurance, except all those other forms that have been tried from time to time. So we must use them even as we strive to improve and replace them.

130
IRM REVISITED
Tor Guimaraes
Information resource management is making a comeback as the most effective and politically stable way to manage computing resources.

138
A PC SUPPORT CENTER
Carlton L. Smith
One company found it could head off the nightmare of micro-mainframe incompatibility and increase the value of its employees by controlling their education in computing.

NEWS IN PERSPECTIVE

34 **OFFICE AUTOMATION**
HP's big office gamble.
36 **SOFTWARE**
Ports in the Unix storm.
Broken windows.
52 **SUPERMINIS**
New race for speed kings.
59 **MANUFACTURING**
A new artist for MAP.
62 **SERVICES**
A new McAuto appears.
70 **BENCHMARKS**

DEPARTMENTS

9 **LOOK AHEAD**
15 **LETTERS**
21 **EDITORIAL**

145 **PEOPLE**
151 **HARDWARE**
159 **SOFTWARE**
167 **SOURCE DATA**
174 **MARKETPLACE**
177 **READERS' FORUM**
183 **ADVERTISERS' INDEX**

INTERNATIONAL 72-1

-2 **MAKING THE NETWORK CONNECTION**
-9 **FINDING THE RIGHT PATH**
-13 **THE CONTENTIOUS TECHNOLOGY**

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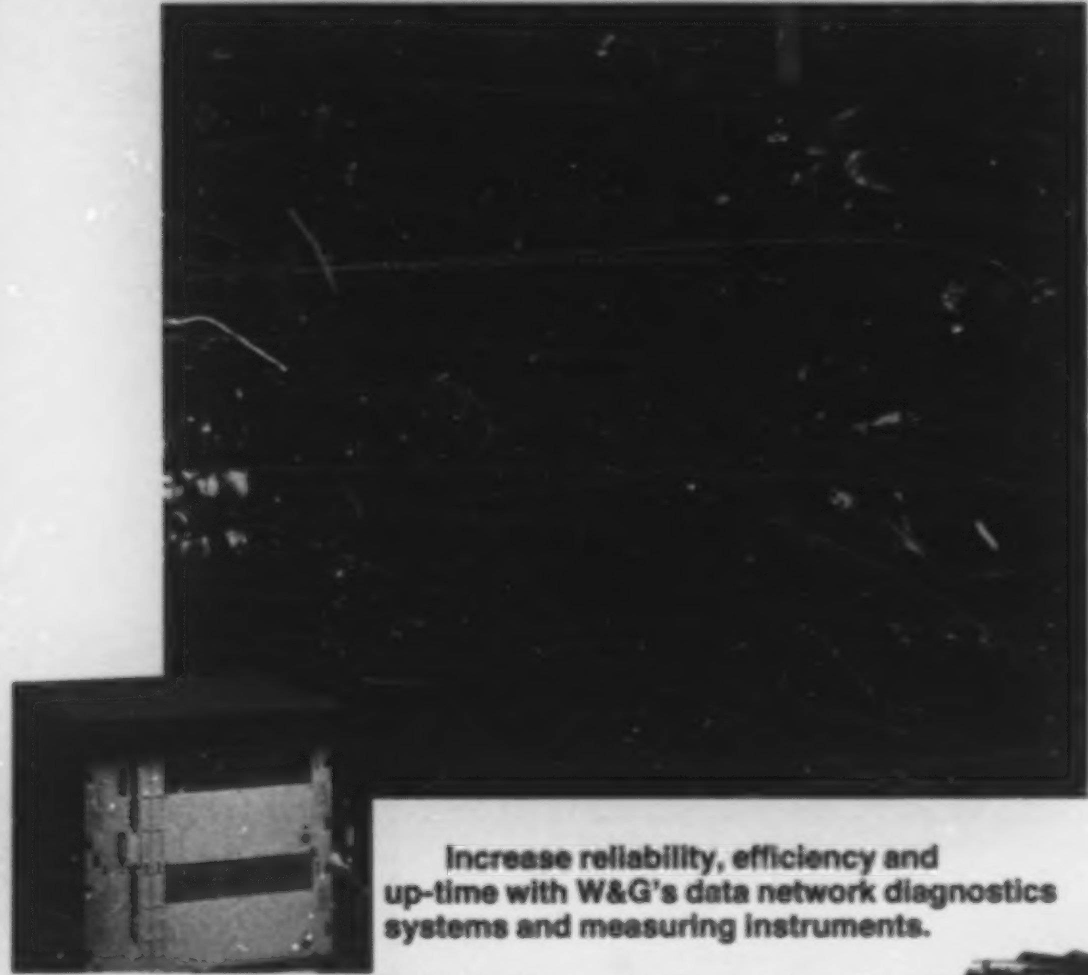

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"Always plan for something bigger than you really need."

out that network managers will probably have to use four separate networks to wire up a building: a star-shaped twisted pair for telephony, a similar network for dumb computer terminals, a baseband coaxial or twisted-pair LAN like Ethernet, and a broadband coaxial or fiber-optic LAN like Wangnet.

"The result," concludes Camrass, "is often a costly mess that offers the minimum amount of system flexibility at the maximum price. The prospects for service integration under these conditions could not be more remote."

Nevertheless, the U.K. boasts more LANs than any other European country. Over 6,500 networks have been installed, according to consultants at BIS Applied Systems. 1983 saw major growth in the use of LANs, and there is now hardly one major U.K. company that hasn't at least experimented with these nets.

The pathfinders, however, are not finding the going easy. Gerry Roff, senior consultant with BIS, believes that users are stymied by problems of network management and the lack of software. Roff also complains about the poor addressing facilities for linking networks across the public telephone system.

"People are still using LANs for unsophisticated and simple applications," explains Roff, "and much of the difficulty comes from concentrating too much on the technical aspects, instead of focusing on how LANs are going to be applied. As a result, lots of people have bought networks and found that they haven't done what they intended."

ITL, the U.K. distributor of Sytek's Localnet 20 (Cablestream), reports that one of its customers, the Michelin tire company, replaced its entire fiber-optic system after experiencing difficulties with the network. Other users are also not making the most of their systems. Wang, for instance, has yet to find a British buyer who's prepared to use all five bands available on Wangnet for voice, image, and data transmissions.

Indeed, most British LANs are used in traditional dp applications to connect either terminals or micros to the mainframes. British American Tobacco (BAT) in Woking, England, claims that this style of networking has boosted the company's revenues by over $5 million in the past two years.

BAT was one of the first users of Racal Milgo's Planet system, a U.K. ring network. "There have been teething problems, but in general the system has exceeded our expectations," says BAT's head of management information services, Bruce Shilstone. "We've saved more money than we thought we would."

Comparing the wiring costs of a Planet connection with a conventional point-to-point link, Shilstone estimates he has trimmed costs by between $2,500 and $10,000 per terminal. "But our main savings," he declares, "have been in reconfiguration. It just takes a few instructions to the director [a module that holds address data] to enable a user to access computers never used before."

BAT, which has three networks that serve 150 terminals, has yet to go full tilt into office automation. Dp boss Shilstone is content to take the long-range view. BAT can in fact go beyond the local dp domain, since it already has access points in each of its offices.

Local processing doesn't get much more local than it does on an island 70 miles off the English coast. The Isle of Man is home to four LANs. They are used by the 25 departments of the Isle of Man government.

Two years ago government dp manager Maurice Mawdsley began to install Hi-Net networks to link groups of users. "What we wanted was a cheap entry point to the mainframe and the opportunity to share resources," explains Mawdsley.

The network Mawdsley installed is the biggest seller in Britain. Digital Microsystems, which developed Hi-Net and associated workstations, has sold 1,700 units in Britain and 3,500 worldwide.

HOLDING HANDS OF LAN USERS

Mawdsley says that the system is not always easy for end users to operate. "It's all very well saying these things are user friendly, but you still have to hold the hands of users," he maintains.

Few network managers have as much handholding to do as ESOC's Blank. ESOC belongs to the Paris-based European Space Agency (ESA), which operates about 350 computers all over Europe—40 mainframes, 110 superminicomputers, and 200 minicomputers. The large number of systems, Blank points out, not only makes it difficult to establish a local datacom network, but also makes it tough to have the right net for long-range transmission among the various ESA centers.

Blank says that ESA's internal communications requirements were completely underestimated. Two pilot LANs that communicate with each other were then installed, one in Noorwijk, in the Netherlands, and one in Darmstadt, West Germany. This year ESA plans to expand the project by connecting the computing centers in Paris and Rome.

From a local networking standpoint, it was important that ESA have a system that could cope with future expansion. So, ESA decided on a cable TV LAN setup. In the Netherlands there are three networks with 150 ports each. In Darmstadt there is a network with 300 ports that will be expanded to 500 this year. The data is transmitted over the net in both synchronous and asynchronous modes.

"The whole area of LANs was a virgin territory for us," recalls Blank. "We dared to leap into the dark."

Colin Bradley, systems services manager at Land Rover, the British four-wheel drive vehicle manufacturer, took his second leap into LAN land last year when his company transferred the work being done at 14 factories to one single 200-acre site in Solihull, Great Britain. In the process, Land Rover installed an ITL Cablestream network that Bradley claims is the third largest broadband LAN in the world.

The new network replaces a CATV system that Bradley says "was starting to cause major concern due to a lack of network design in the early stages and the inflexibility of the installed equipment." It allowed users to connect to only one computer. Land Rover ripped out 10 miles of cable last Easter, replacing it with a new system.

"Always plan for something bigger than you really need," advises Bradley. "We could not forsee two years ago that our network would grow to 18 miles in length." The rejuvenated LAN has two gateways to SNA and 3703 async with telex, videotex, and X.25 links in the works.

In Scandinavia, local area networking is evolving at a slower pace than it is in Britain. One person who's stepping up that pace is Jakko Castren, dp manager at Kansallis Osake Pankki, Finland's largest bank. Castren is in the process of determining which LAN approach will best augment the bank's existing dp network.

Chances are the bank will adopt one of IBM's LAN systems, since the existing network is being converted to SNA. The bank's on-line system, which has been operational since 1975, was the result of a major development effort between the bank and Nokia Data, Bull's representative in Finland. Standard software was not able to cope with the bank's needs, so extensive tailoring was necessary. The system, which supports 3,000 terminals, works well, but it still is not flexible enough, according to Castren, who finds it very difficult to implement major changes.

To solve this problem, the bank decided last year to come up with a new generation of the system that could run on IBM mainframes. The availability of SNA was, of course, a telling factor. The new system is expected to be in pilot operation beginning next year, with full replacement of the present system scheduled for 1990.

Norwegian service bureau Fjerndata has also taken the IBM road to networking. "More and more we live in an IBM-dominated world," declares Oer Horgen, head of Fjerndata's telematics department. "In many areas IBM is a generation ahead," he argues.

PEOPLE-INTENSIVE NETWORKS

Horgen runs an SNA-based star network. Six 64Kbps digital trunk lines along with 200 ordinary leased lines support about 100 batch and 2,000 interactive terminals. It is a tough network to manage, asserts Horgen, who says that monitoring line quality and detecting errors on the net are becoming more and more demanding tasks. "We now have a network operations group of eight to 10 people working two shifts," he explains. "While computer operations are becoming less and less people intensive, network operations are on the opposite track. Besides monitoring line quality and uptime, we also sample subjective opinions of our users every week. We often find that measurements and opinions of quality differ significantly."

Horgen also has other hassles when it comes to getting lines from Norway's sluggish telephone authority, Televerket. "When customers make a decision about extending the network they should be able to implement the extension quickly," complains Horgen. "We cannot wait for Televerket's three- to six-month delivery. In an operation like ours we must have excess communications capacity."

This line problem is being tackled by all the telephone authorities across Europe, particularly the French DGT, which is investing massive amounts of money to try to improve the national communications network.

The French packet switched data service Transpac began operating in the early '70s, just after the world's first national data net was established across the border in Spain. This year the packet net will be enhanced considerably. The DGT will also start offering new data communications services—Transfix, Transcom, and Transdyn. Both Transfix and Transcom will be solely for transmission within France, whereas Transdyn, which will use France's recently launched Telecom 1 communications satellite, will transmit throughout Europe.

TOSHIBA'S TOTAL APPROACH

Leave it to the Japanese to come up with the Total approach to networking. That's what Toshiba Corp. did when it designed the Toshiba Office Automation and Telecommunications Architecture and Logistics (Total) network.

The net, considered to be one of Japan's most advanced local area networks, went into operation one year ago in Toshiba's new 40-story headquarters building in Tokyo.

Each floor is linked by 10 optical fiber channels, each having a data transfer rate of 100Mbps. The network, which extends horizontally in an Ethernet-like configuration, connects a slew of terminals, micros, word processors, fax machines, and minicomputers located throughout Toshiba's high-rise headquarters.

Toshiba produces all the hardware and software used in the net, except for the mainframe, which is an Acos system supplied by NEC Corp. The company has also made one sale of the system to Meij Mutual Life Insurance Co. in Tokyo.

But does the Total network work? Toshiba, by its own admission, is a neophyte at networking. A quick glimpse at the offices not included on Toshiba's tour of its "network showcase" reveals plenty of paper piled on desktops. So although the network works, many Toshiba employees still seem to prefer working in more traditional ways.

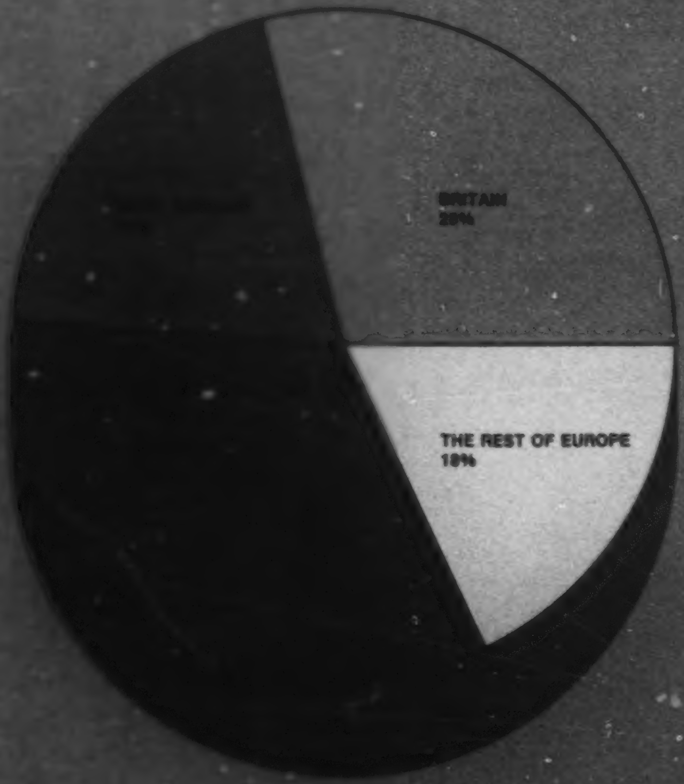
"Realizing the full potential of our network is an ongoing process," admits Tadao Hayashida, senior manager of Toshiba's information systems business group.

"The investment is made. Now it's a matter of learning how to use what we've got."

—Thomas Martin

FIG. 1

LOCAL AREA NETWORK MARKET FORECAST*



*1990 REVENUES
SOURCE: FROST & SULLIVAN

"What is needed now is for costs to fall, so we can do more."

Marc Auzet, manager of professional products and services in the DGT's commercial division, believes that these three services will give the user a comprehensive choice of data communications services that will be the core of an integrated digital network, and that will utlimately handle both voice and image.

In all its datacom developments, the DGT is wedded to the principle of international communications standards. The International Standards Organization's Open Systems Interconnection (OSI) standard is the bible of telecommunications in France and the DGT is one of its apostles. "We use the norms laid down by international bodies," explains the DGT's Henri-Alain Combet. "The problem is to see if suppliers will design products that correspond to these international standards. From the user's point of view, it is important to have stable and published interfaces. Users don't like to be tied to a single supplier.

OSI standards are of particular interest to the Banque National de Paris (BNP), France's second largest bank. BNP currently has a dual-circuit network with both IBM and Bull hosts. Rene Regnard, head of the network systems design division in the bank's dp department, outlines BNP's strategy. "Our long-term aim is to have a single OSI network for all machines, which is not possible at the moment," he says. "The SNA network for IBM machines will be linked via Janus [Bull's communications software] to Bull's DSA network. It will be a great advantage to have a better choice of terminals—unrestricted by the problem of communications protocols."

French department store group Nouvelles Galeries has a highly developed network that uses Transpac for long distance communications. It has 130 connections to the packet switched data network, which is managed by an IBM 3083, with two 3705s. Leased lines are used for local links and for a few long distance connections when there is a large volume of data to be transferred. "Our networks operate mainly on Transpac," explains Nouvelles Galeries' systems and networks manager, Marc Raffali, "but Transpac is not economic for short distances, so we use leased lines. We have about 40 in Paris alone."

Therein lies one of the most significant obstacles to true integration between dp and communications technologies. Europe's network managers, wading through the technical and management problems of establishing and monitoring a network, can do little about the even thornier issue of cost. When it comes down to the bottom line, networking is still an expensive business.

"What is needed now," declares BNP's Regnard, "is for costs to fall, so that we will be able to do more. So far, telecommunications tariffs haven't fallen, unlike dp costs. We are waiting for that drop that will enable us to invest in new services."

So, while the promised land of integrated computer and communications systems may be in sight, it is an expensive and uphill climb to get there. That climb often causes even the most cautious network planners to get trapped in their own nets.●

Also contributing to this article were Alain Blaes, James Etheridge, Peter Hidas, and John Lamb.

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CIRCLE 102 ON READER CARD

What to watch for as the competing network technologies line up at the gate.

HANDICAPPING LANS

by Martin Pyykkonen

It is a package of media, transmission devices, interface units, network-management hardware and software, end-user devices, and applications software for the provision of communication between dissimilar nodes in an intrabuilding or intracampus environment. In other words, it is a local area network. Herewith, an update of what's current and a forecast of what's likely to happen to LAN technology and to the LAN market.

LAN technology has three major elements: transmission media, network topology, and network access.

The four media currently used in LANs are twisted pair, baseband coaxial cable, broadband coaxial cable, and optical fibers. While each offers its own benefits for LAN applications, the trend in LAN installations is toward optical fiber, being pushed hard by AT&T, IBM, and Japanese vendors including NEC, Hitachi, Fujitsu, and Toshiba.

AT&T, IBM, and other domestic vendors will still consider alternatives to optical fiber, but the Japanese are basing virtually all of their LAN schemes on optical fiber. They may have problems. Despite optical fiber's technical benefits, its higher initial costs and more difficult implementation will limit user acceptance until later in the decade.

Bus, ring, and star are the three major LAN topologies (Fig. 1), each of which has advantages and disadvantages. Choosing one depends on criteria such as information throughput, network flexibility and expandability, device connectivity, cost, and reliability.

About 60% of the major products in the LAN market are bus oriented. The primary benefits of a bus include high-speed transmission, unlimited LAN distance, easy user node reconfigurations, and high network reliability. Using this topology, the best information throughput is obtained in light and sporadic traffic conditions.

The ring is a newer, more sophisticated, and still evolving topology. While the entire ring can be brought down by a single node failure, limiting network reliability, ongoing standards development, and low cost per node will make the ring topology popular in future LANs.

STAR TOPOLOGY RELIABLE

The star topology provides greater network reliability: only the failure of the central node can disrupt the entire network. But users can expect to pay more for this greater reliability.

Access methods can be either centralized or distributed within the LAN. Centralized access allocates a time slot or frequency channel to a particular user node. This is the access principle behind the circuit switching of PBX networks.

Distributed access is predominant among baseband, broadband, and token-ring LANs. Within distributed methods, Carrier Sense Multiple Access (CSMA) and token-passing access are available. The CSMA method is statistical: an individual node senses whether the network path is available for transmission, and only one user node is allowed to occupy the channel at a time. The token-passing method is deterministic: access will be permitted sequentially, determined by possession of the network token.

LAN hardware and software vendors face various user-acceptance hurdles, one of the most serious being unresolved network standards. End users cannot rely on these standards until they become truly established, a process that could take two to three years.

While the LAN market will grow vigorously for the next 10 years, there will be more vendors dividing it. Traditional LAN vendors, including Digital Equipment, Wang, and Xerox, will offer network solutions based upon their installed base of computers and related office equipment. Communications equipment vendors, primarily AT&T, will offer LANs built upon existing wiring networks and new universal wiring plans.

The most significant competitive threat to the LAN suppliers will come from PBX vendors selling products with enhanced data communications capabilities. This could open new opportunities for LANs, since LANs and PBXs offered in the next two to three years will be more compatible than those available today.

Major application areas for LANs are office automation, factory automation, education, R&D facilities, and military and other government installations. Because of the proliferation of office products with communications capabilities (including personal computers, word processors, and intelligent workstations), nearly two thirds of all LAN applications will be in office automation networks; factory automation will account for nearly 25% of the LAN market by the end of the decade.

The LAN will be a major factor in promoting efficient office and factory integration. Three major segments of the LAN market will be high-speed data links between mixed mainframe/minicomputer networks; the connection of standalone pcs and intelligent workstations; and the integration of office equipment such as print servers, file servers, and word processors.

As of 1985, the LAN market is shared by seven different technologies, each in a different stage of evolution. (Fig. 2 estimates each classification's share of the total LAN market in 1987.)

Baseband bus. This kind of LAN, currently available from Digital Equipment, Datapoint, Xerox, Interlan, and 3Com, will maintain a strong position in the near term based on the wide acceptance of the Ethernet standard and on product offerings from several strong vendors.

Broadband bus. This existing product category, offered by Wang, Ungermann-Bass, Interactive Systems/3M, and others, will also remain strong, based on a significant installed base and an anticipated need for high bandwidth capabilities in the future. Applications will become more spe-

The LAN will be a major factor in promoting efficient office and factory integration.

cialized toward the end of the decade, however.

Centralized LAN. This product will follow the centralized control and access scheme of the PBX, and it will provide an alternative to more distributed control baseband, broadband, and token-ring LANs. AT&T will be a powerful force in the centralized network market based on its strength in communications networks and the twisted-pair wiring it already has in offices. These LANs will gain market appeal on the strength of a centralized approach as local networks increase in size and number.

Token ring. By 1988 this product will be important because of its networking efficiency and flexibility, IEEE standards activity, IBM's endorsement, and the integration of token-ring LANs into some PBXs. There will be a growing need to connect multiple-ring LANs in office networks.

Token bus. Because of the need for high throughput of more bursty data flow than is typical in the office, this will be the primary LAN for factory automation applications. The sequential flow of a token around a ring would be cumbersome for most factory networks. General Motors' endorsement of the token bus is likely to be seconded by other large factory networks in the next couple of years.

Third generation PBX. Star configured digital PBXs with up to 64Kbps data capacity will meet many local area data needs over the next five years. Their ability to integrate voice and data over existing networks will add benefit to many applications. Enhancements to this class of PBX will produce interfaces to accommodate coexisting LANs and PBXs.

Fourth generation PBX with integrated LAN. In 1985 several of these products will be available; very high bandwidth and data management features will allow users to establish networks and then add data traffic to existing voice capabilities as needed. The success of the PBX vendors in the local area network market will depend on their ability to offer such integrated PBX/LAN products.

Five major criteria will determine what LAN solutions end users will choose over the next three to five years: increased data traffic, physical distribution, network control, local transmission media, and interfaces beyond the LAN.

NEEDS NOT GREAT TILL LATE '80s End users will realize that many local area networking needs can be sufficiently served by third and fourth generation PBX equipment, and that their need for truly high bandwidth capacity will not be real until the late

FIG. 1

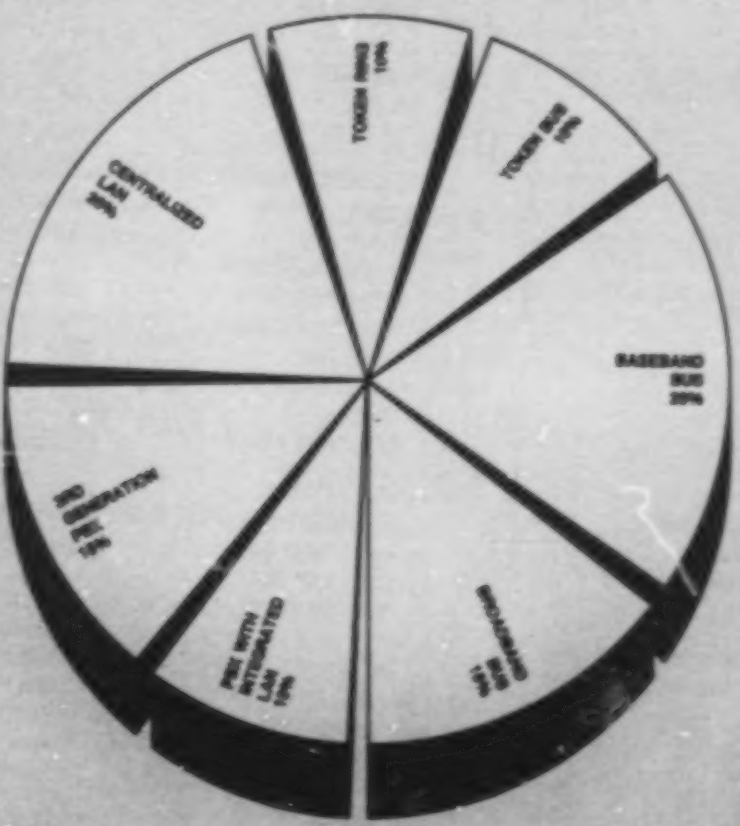
LAN TOPOLOGY—ALTERNATIVES AND RELATIVE PERFORMANCE

	BUS	RING	STAR
Information throughput	Decreases with each added node	Decreases with each added node	Dependent on capacity of central node
Flexibility	High	Moderate	Low
Expandability	High	Moderate	Dependent on capacity of central node
Connectivity cost	Moderate	Low	Initially high, incrementally low
Reliability	High	Low	Moderate

FIG. 2

U.S. LAN MARKET SHARE, BY CLASSIFICATION

1987



SOURCE: ARTHUR D. LITTLE INC. ESTIMATES

Many LAN needs can be sufficiently served by third and fourth generation PBX equipment.

1980s. Voice/data integration and predominantly asynchronous networks will be better served by PBX alternatives.

In addition, users with high data-capacity needs will be able to cost-effectively upgrade their data networks by using latest-generation PBXs with LAN-based data architectures. The presence of an in-place, twisted-pair wiring network in a PBX will affect short-term decisions regarding the purchase of a LAN.

Increasingly, users will view either the IBM Cabling System or AT&T's universal wiring plan as a comprehensive, long-term local network solution. But early commitments to either distribution scheme will be more a function of allegiance to AT&T or IBM rather than to the particular product solution.

Within the local area network, centralized control will become more widespread as end users realize its benefits for predominantly asynchronous and nonintelligent nodes.

Network topology and access schemes will be more important than media in most local area network selections, as multimedia products are offered by many vendors. There will be more mixing of media within single local area networks as LANs continue to grow in size and number of installations. By 1990, optical fiber backbones and twisted-pair branches will coexist and comprise the largest share of high-capacity networks.

LAN decisions will more and more be based on LAN interfaces to wide area networks (WANs), networks that extend beyond the local campus or building. Users will realize that a LAN is only part of a total solution to data communications needs and that chosing a certain LAN may make the benefits of interface with specific WANs impossible. These interfaces will be even more important to end users concerned with the integration of voice, video, and data throughout their entire networks.

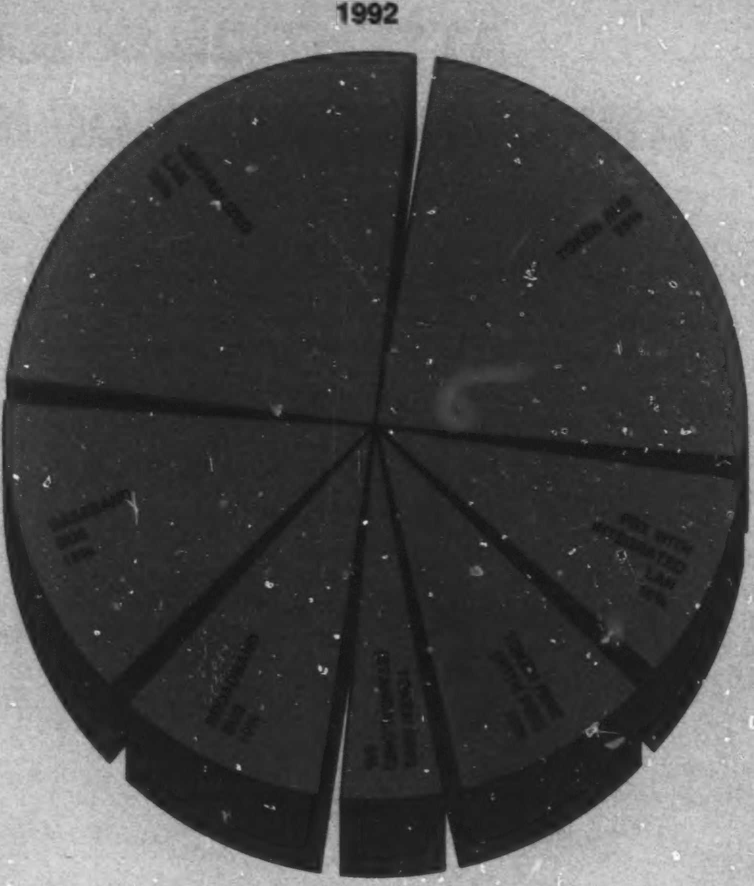
By 1992, user needs will have produced a different set of LAN characteristics: baseband bus and broadband bus LANs will see continued sales growth through 1990 but their markets will be smaller than in 1985. The bus LANs will lose market share to a combination of token ring LANs, centralized LANs, and integrated PBX/LANs.

Ethernet baseband systems will remain strong, based on their success in the market through 1985 and their acceptance by computer and office equipment manufacturers, including Digital Equipment, Xerox, and Intel.

Broadband bus LANs will consist mainly of networks with relatively few high-bandwidth nodes—these will predominate in many industrial applications, including CAD/CAM.

FIG. 3

U.S. LAN MARKET SHARE, BY CLASSIFICATION



SOURCE: ARTHUR D. LITTLE INC., ESTIMATES

INCREASE IN TOKEN-RING LANS

The number of token-ring LANs installed will grow significantly through the mid-1990s. In some cases, the token-ring LAN will be complete in itself, while in other cases multiple rings will be linked through star-wired PBXs. Alliances currently forming between computer and communications vendors—the IBM acquisition of Rolm, for example—illustrate this trend. Because multiring networks will be very large, it will be most efficient to link them via the centralized control of a star-wired PBX.

PBX vendors will continue to increase the data capacity and LAN features of their products. Significant market-share gains will be realized by 1990 for those vendors who are able to install voice/data systems before late 1986, when broadband token rings become solidly established.

In the early '90s, the token bus will remain the dominant LAN for factory automation applications, especially for large networks with many nodes. Smaller factory networks may be served by a mix of baseband and broadband LANs with factory applications enhancements. Other communications vendors may follow the lead of AT&T in offering non-PBX, centralized LANs. Centralized-control LANs will be particularly well suited for those networks largely composed of dumb devices.

Three major categories of competitors will pursue the LAN market through

Centralized control of a LAN will become even more critical as LANs grow in size and complexity.

the 1980s: computer/office equipment vendors, communications equipment vendors, and specialized LAN vendors.

The majority—65%—of LANs already in operation have been installed by the computer/office equipment vendors including Digital Equipment, Xerox, Prime, Wang, and Datapoint, and the rest—35%—by specialized LAN vendors such as Corvus Systems, Proteon Associates, Sytek, 3Com, Interlan, and Ungermann-Bass.

The following competitive trends will develop over the next 10 years:

1985-1987. Major PBX vendors, including AT&T, Northern Telecom, Rolm (IBM), NEC, and Intecom, will increase their collective market share in local area networking applications. End users will find that these vendors' PBXs have sufficient capacity to handle their near-term data needs. End users who make this PBX commitment will look to these venders to offer integrated LANs within the PBX network to meet their longer-term data traffic needs. The PBX vendors will gain local area networking market share mainly at the expense of existing baseband LAN vendors.

AT&T's ISN LAN will become a significant entry in the market as end users recognize the benefits of its standard twisted-pair wiring, its centralized control features, and its growth potential via fiber optics. The ISN will accommodate distributed processing among intelligent devices while it provides centralized administration of the local network.

The specialized LAN vendors will direct more attention to LANs in factory automation. This will be a response to the increasingly crowded office LAN market (especially after the entry of AT&T and IBM) and also to a growing number of factory workstations that will need to be linked.

1988-1994. Fig. 3 shows an estimate of the relative market share for each sector of the total LAN market in 1992. The IBM Cabling System will have so penetrated the market that IBM could override the advantage of PBX twisted-pair wiring networks with the Cabling System's flexible arrangement of twisted pairs, broadband coaxial cables, and optical fibers.

Centralized control of a LAN will become even more critical as LANs grow in size and complexity, in both the office and factory. AT&T's ISN will be well established by 1988-1990, and IBM will have successfully merged Rolm's PBX technology into its LAN offerings. There is likely to be an IBM/Rolm PBX with sufficient capacity to centralize multiple token rings in a star configuration.

AT&T, IBM, and any other future centralized local area network vendor will capture the major shares of high-capacity local area networking applications, but through the early 1990s, there will not be a clear winner in the battle between AT&T and IBM.

The specialized LAN vendors will face moderating growth from 1985 to 1990 and a gradual decline thereafter through 1994. In response to this gradual shakeout, many vendors will pursue industry-specific application niches by the early 1990s. Customized application software packages will be a major opportunity for go-it-alone or joint development with AT&T and IBM. ◉

Martin Pyykkonen is a senior consultant with Arthur D. Little Inc. in Burlington, Mass.

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1985 DP BUDGET SURVEY

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FEATURES

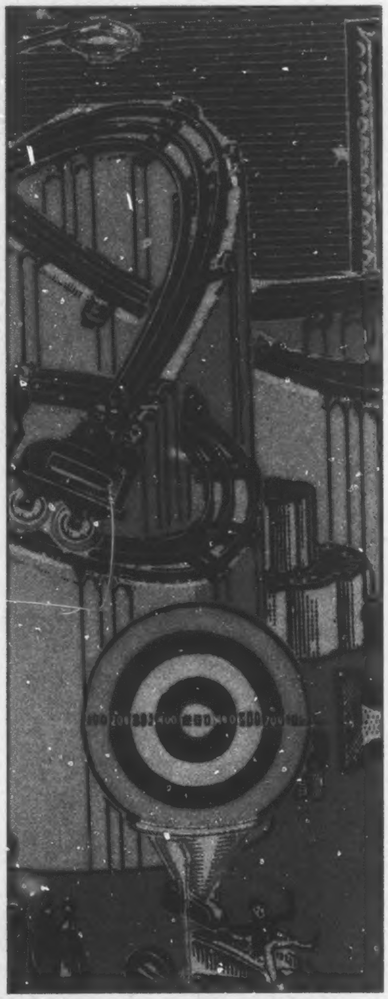
30
IN FOCUS

As programmer costs rise and hardware costs fall, users are "Getting a Grip on Tools" to reduce software costs. Edith Myers reports that vendors are supplying the productivity packages like never before.

74
THE 1985 DP BUDGET SURVEY

John Verity

Dp budgets up. Pcs leveling off. Minis up. Mainframes down. Software up. 642 dp managers from variety of industries surveyed. Details within.



82
FAULT TOLERANT BLUES

Omri Serlin

Will a potential boom market be tolerant of the faults of new FT system suppliers?

105
GLOBAL, SHARED, LOCAL

Cort Van Rensselaer

After octupling the number of its computers and vigintupling the number of its workstations, Hewlett-Packard is still matching its information systems to its organization and management style.

119
BABBAGE OBSERVED

Leopold Froehlich

The Abner Doubleday of data processing is remembered.

128
IN SEARCH OF THE PERFECT PROGRAMMER

Chandler M. Bush and Lawrence L. Schkade

No ideal personality or cognitive style for the dp professional has emerged from the latest test results. What's needed is a good matchup of user and system.

NEWS IN PERSPECTIVE

40 **MAINFRAMES**
Here come the Crayettes.

42 **OFFICE AUTOMATION**
Apple's new Mac push.
An OA merger fails.

57 **SOFTWARE**
Keeping pirates at bay.
Hard time for bank software.

66 **PERIPHERALS**
Terminal traumas.

70 **BENCHMARKS**

71 **WORLD WATCH**

DEPARTMENTS

8 **LOOKING BACK**
13 **LOOK AHEAD**
18 **CALENDAR**
23 **LETTERS**
27 **HARDCOPY**

141 **HARDWARE**
149 **SOFTWARE**
156 **MARKETPLACE**
157 **ON THE JOB**
163 **READERS' FORUM**
168 **ADVERTISERS' INDEX**

OEM SUPPLEMENT 136-1

-2 **SUPERMINIS HEAT UP**
-8 **THE BINARY BADGE**
-17 **FOR WHOM THE BABY BELL TOLLS**

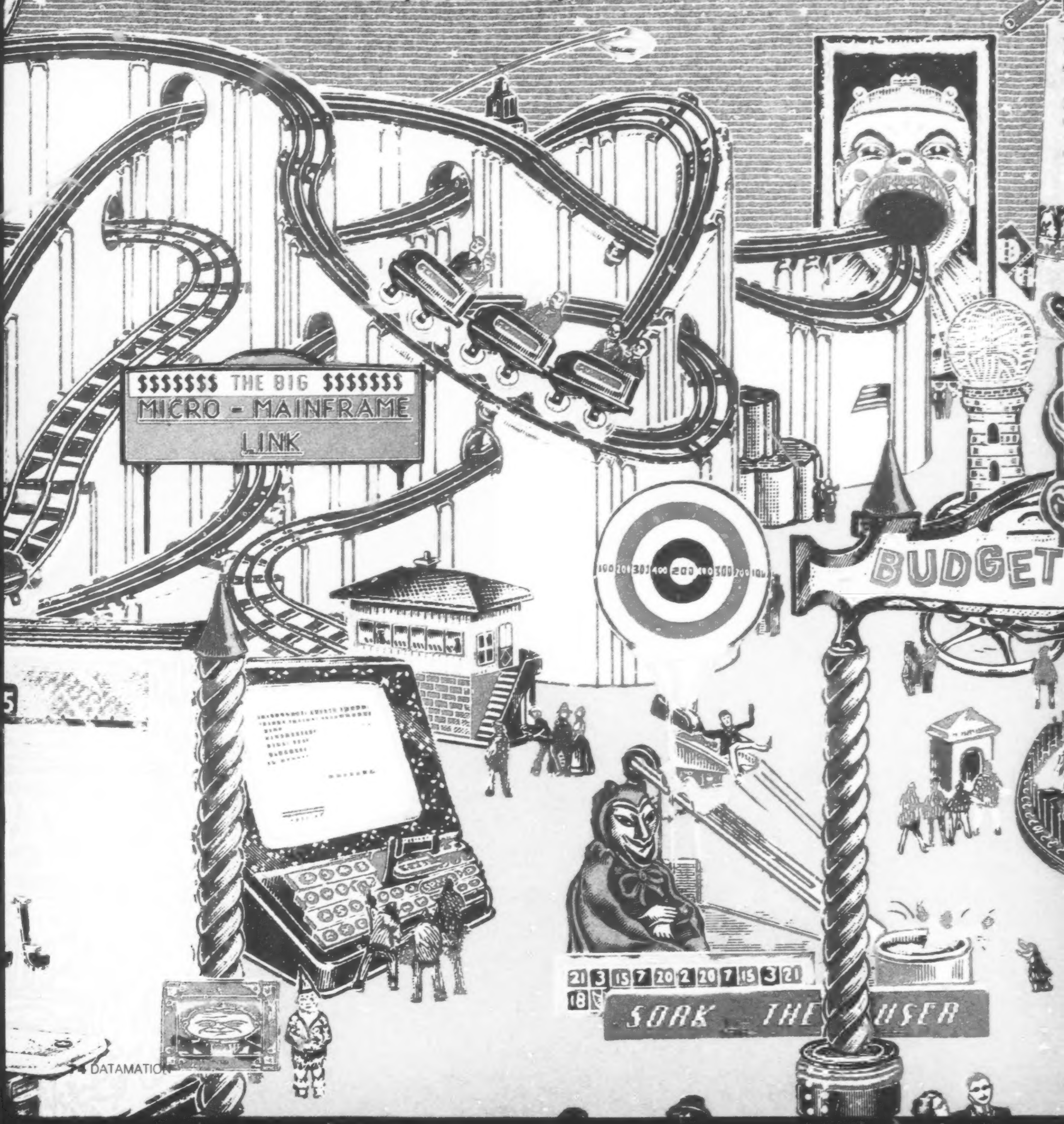
COVER ILLUSTRATION BY JOHN CRAIG

1985 DP BUDGET SURVEY

Market saturation seems to be slowing the pc's roller-coaster ride to success as a major budget line item, according to our survey of dp budget managers.

by John W. Verity

Is the corporate personal computer market slowing down after the past few years of explosive growth? It appears that way, according to a recent DATAMATION survey of data processing budgets at companies across the nation. While dp budgets as a whole will be up in 1985 an average of 7.4% over 1984, the portion of those budgets devoted to pcs has dropped for the first time since the ubiquitous machine entered the market eight years ago.


$$$$$$$ THE BIG $$$$$$$
MICRO - MAINFRAME
LINK
BUDGET
21 3 15 7 20 2 20 7 15 3 21
18
SOAK THE USER

The survey also found a slight decline in average spending for mainframes, a move matched by a slight increase in minicomputer spending. The portion of budgets set aside for software continued to increase, reflecting the long-standing desire of users for boosts in programmer productivity and general user efficiency. Spending for microcomputers showed a particularly strong increase, according to the survey, which polled responses from 442 dp managers throughout the country and from a variety of industries, from both the manufacturing and services sectors.

The average dp budget for 1983 among the survey population will be $452,000, up from the $421,000 indicated for last year.

While there were no dramatic changes in the different line items for which dp managers are spending their money, the growth in purchases of per-

LOTUS
1 2 3
PC
bumper cars
PC
PARK
DATACOM'S
WACKY WIRES

"People often ask me how I did my job without a pc and I can't really answer them."

sonal computers does appear to be leveling off, albeit at a substantial and heady level: As some industry analysts have recently claimed, the corporate pc market's explosive growth is tempering this year, primarily because many end users that need pcs already have them, leaving the untapped market smaller than last year's.

"We said, 'Hey, we've got enough [pcs] for now,' " says Bob Cook, controller of Marine Bank Services Corp., Milwaukee, which supplies dp services to Marine Bank. The company has installed about 100 personal computers from IBM and Apple Computer to give desktop computing to end users. "If there's a dire need for another one, we'll get it, but I think things are slowing down."

Cook notes that Marine Services has had an information center offering end-user computing from a mainframe up and running for several years, but the personal computers have not reduced its use very much. Most of the applications brought up on pcs have been new ones, never before performed on computers at the company. "People often ask me how I did my job without a pc and I can't really answer them," he states.

Last year, spending for pcs accounted for 9.6% of the average dp budget at companies of all sizes, but in 1985 it will account for only 8.8%, according to the survey. On the other hand, spending for microcomputer software at sites of all sizes will rise almost 10% to 4.5% of the average total budget. Analysts have suggested that one out of three white-collar workers already has daily access to a pc of some kind; another figure that suggests growth in corporate personal computer installations may be tapering.

Observers had once expected the pc to continue moving into corporations at a rapid clip for several years beyond 1985. It now appears, however, that just as the home pc market may have seen better days, so too is the corporate arena approaching a saturation level. While there is certainly room for more pcs in the office, the huge sales of recent years won't be repeated.

MORE PCS IN FORTUNE COMPANIES

On the other hand a somewhat different pattern can be discerned at large companies—those falling into the Fortune 1,000 industrial or Fortune 400 financial and services rankings—where spending for pcs will actually rise to 3.8% of the total dp budget this year, up almost a fifth from the 3.2% reported for last year. As predicted, these desktop machines are evidently being used to offload many computing tasks from host mainframes and to enable managers, analysts, and others to perform local jobs such as word processing, spreadsheet analysis, and electronic mail.

At American Sterilizer Co., Erie, Pa., pcs will be installed this year to offload end users who have been "going crazy" with VM/CMS-based information center applications, according to John "Jack" Prehoda, assistant vice president of data processing. "The cost many of these people have incurred on the mainframe far exceeds the cost of a pc," Prehoda comments. "We hope to be able to eliminate an IBM 4381 that's now serving our information center's users. Most of them are doing spreadsheet analysis, which calls for high cpu utilization."

He notes that the company will move almost 60 people from the 4381 to pcs in the coming year, while the rest of the almost 500 people using information center applications like PROFS, SAS, and Dynaplan will be moved to a 3033 processor already installed. The survey revealed, however, that most pc users have yet to attach their desktop machines directly to mainframes, despite the widespread availability of so-called micro-to-mainframe links. That market is evidently still in its infancy, despite all the buzzwording that has surrounded it.

One speculative explanation for the apparent leveling of pc budgets is that corporate users are now more interested in pcs that can network directly with mainframes, as opposed to standalone machines. The most appropriate IBM products for that job are the PC/3270 and the PC AT, both of which are experiencing large backlogs and limited production at the company. Some observers suggest that the majority of standard PCs and PC XTs needed by corporate users may already have been installed.

It may also be that the corporate acquisition of pcs is now entered on the books outside the formal dp budget. This year's survey found that on average, Fortune-class companies are spending $128,000 on pcs outside the dp budget and that among all sites surveyed, about $73,000 is being spent that way. Similarly, Fortune companies on average will spend $54,000 for pc software while all the surveyed companies will spend $32,000 on average.

It is perhaps too early to tell if corporate pc installations have actually peaked for good, but—as forecast in last year's DATAMATION budget survey ("The Dp Budget Survey: Pcs Make Waves," April 15, 1984) and Cowen & Co./DATAMATION mini-micro survey ("Upstarts Outshine the Stars," Nov. 15, 1984)—certainly the past year has seen a real surge in their use.

"We've seen an explosion of personal computers," comments Tom Prinz, manager of resource planning and control at First National Bank of Louisville in Kentucky. He notes that the bank has also been expanding its mainframes "quite a bit" with processor upgrades to better handle a fast-expanding communications network and new applications software. Attached to the network are many automatic teller machines and a new administrative network bringing branch offices on-line. Next year, notes Prinz, teller stations may be added to the network.

Although faced with a "very tight budget" this year due to the controversy surrounding the Seabrook nuclear power station, Central Maine Power Co., Augusta, has also found "some cost-effective applications for pcs," according to Willi Hartung, manager of information systems. "We plan to expand their use in 1985," he says.

Mountain Fuel Supply Co., Salt Lake City, installed some 50 personal computers last year and will add another 70 this year, according to John Gogo, cost allocation administrator. Many of the machines are IBM's 3270 PC models, which are being used by systems developers in building programs. Gogo says the small machines have been able to take over substantial compiling tasks from the mainframe. Other pcs are in use for statistical analysis, forecasting, and geophysical computing, he notes, adding that the company has been able to install about 10 IBM PC ATs, despite IBM's inability to fill all orders for the recently introduced machine.

PERSONNEL STILL TOPS LIST

The all-important category of personnel is naturally the far biggest line item in the typical dp budget: this year it is expected that personnel will take 38 cents of every dp dollar, up only slightly from the 37.8 cents indicated for last year's spending. The industry spending the most of its average budget on personnel this year is wholesale/retail distribution, with 48.2%, while the lowest spender in that budget category is transportation, with only 24.2%, according to the survey.

Dp managers said they would have an average of 20.1 people working for them this year, up from 18.5 last year.

The managers are apparently giving their staffs advanced software tools to increase productivity and cut down on staff growth. Spending on systems software is expected to be up, on the average, rising to about 1.5% of the total budget this year from 1.3% last year, the survey indicates.

FIG. 1

THE TYPICAL DP BUDGET

BUDGET ITEM	ALL SITES 1984	ALL SITES 1985	FORTUNE-CLASS SITES 1984	FORTUNE-CLASS SITES 1985
Personnel	37.8%	39%	38.8%	38.1%
Mainframe cpus	7.7	7.5	14.1	13.7
Minicomputers	7.2	7.3	7.7	8.0
Mass storage	2.0	1.8	2.8	2.7
Terminals	2.4	2.7	4.0	4.2
Desktop systems	0.9	0.8	0.6	0.6
Personal computers	9.6	8.8	3.2	3.8
Printers and peripherals	3.6	4.4	2.8	2.9
Consultants	2.2	1.7	1.5	1.5
Outside dp services	3.2	2.7	2.5	2.7
Data communications	2.8	3.1	4.8	4.7
Applications software	2.6	2.5	2.9	2.9
Systems software	1.3	1.5	2.1	2.1
Microcomputer software	4.1	4.5	1.0	1.2
Supplies	7.6	7.9	6.2	6.2
Overhead, rent	4.4	4.0	4.5	4.1

FIG. 2

CHANGES IN DP BUDGETS BY INDUSTRY, 1984 VS 1985

INDUSTRY CATEGORY	
Durable goods mfg.	7.4%
Consumer goods mfg.	6.1
Banking	−16
Financial services	5.6
Edp services	12
Transportation	29
Utilities	0
Medical and legal	6.2
Education	2.0
Government	29
Distribution	21.1
Other	5.1
Average	7.4

FIG. 3

ESTIMATED DP SPENDING OUTSIDE OF DP BUDGET (MEAN)

	PC HARDWARE	PC SOFTWARE	OTHER HARDWARE	OTHER SOFTWARE	PROGRAMMERS	COMPUTING SERVICES	CONSULTANTS
Fortune Sites	$128,000	54,000	130,000	32,000	107,000	$40,000	47,000
All Sites	$73,000	32,000	69,000	16,000	56,000	$20,000	25,000

"The rise in people cost has been steep," notes Raymond Priore, vice president of systems and information processing at Consolidated Edison of New York, the electric utility. Con Ed's entire dp budget was up a full 30% from last year, due largely to the fact that the company has decided to purchase more of its IBM mainframe equipment rather than lease it. "No doubt software is increasing percentage-wise faster than anything else, but it gives our programmers more bang for the buck."

Priore, like other dp managers, has found systems software packages, fourth generation languages in particular, useful in boosting programmer productivity significantly. "The number of people will still escalate," he adds, "but not as rapidly as before."

Overall, the portion of budgets devoted to hardware—including mainframes, minicomputers, mass storage, terminals, single-function desktop computers, personal computers, printers, and all other peripherals—is seen as remaining at the 33% level from 1984 to 1985. Software's percentage—including systems and applications software for mainframes and minis, consulting services, outside computing services, and all microcomputer software—on the other hand, will probably drop a little, to 12.9% in 1985 from 13.4% in 1984.

In software spending among the Fortune companies, a rise is indicated for this year only for pc packages, to 1.2% of the total budget this year from 1% last year. Spending on software for mainframes and minicomputers will remain level, at 2.9% for applications packages and 2.1% for systems packages, the survey found.

"We've historically bought our software on the outside," commented Bob Cook at Marine Bank Services in Milwaukee. "We rarely do our own."

Probably because of the large amount of batch processing they perform, consumer goods manufacturers and wholesale/retail distributors in the Fortune-class sample showed the highest planned budgets for mainframes, averages of 16% and 17.3%, respectively. Not surprisingly, educational organizations said they would spend only 2.4% of their dp budgets on mainframes this year: schools and universities have been using personal computers lately to provide their students with computer training.

Minicomputer budgets appear to be up slightly, rising to 7.3% from 7.2% of the total budget among the entire survey population, and to 8% from 7.7% among Fortune-class users. Durable goods manufacturers and financial services companies are spending the biggest portions of their budgets on minis, the survey revealed.

Data communications spending evidently will be up this year, but again only slightly. The total sample of respondents said they had used an average of 2.8% of their budgets last year for datacom, although they plan to boost that level to 3.1% in 1985. Among Fortune-class users, however, a slight drop in datacom spending levels is expected, 4.7% in 1985 compared with 4.8% last year. The transportation in-

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METHODOLOGY

The 1984 DATAMATION poll was designed to directly reflect the spending patterns of the magazine's circulation base. This year the senior official at each of the Fortune 1,000 industrial firms and Fortune 400 financial and services firms that subscribes to the magazine received the two-page questionnaire. In addition, 3,500 questionnaires were sent to a random sampling of the key official at each site where DATAMATION is received. This combination approximates the population of the circulation base: one third working for Fortune firms, two thirds working for smaller firms and institutions.

Of the 4,900 questionnaires mailed last November, 642 were completed and returned before the mid-December cutoff date; 265 companies from the Fortune 1,000 and 400 groups are included in the database. The 13% response rate is typical for such surveys of DATAMATION readers when no financial incentive is offered.

Of the respondents, 35% are managers of computer operations, 5% are dp staffers, 28% are corporate officials, 8% are in the financial office, 7% are administrative personnel, and 6% are educators and consultants.

By industry, the percentage of respondents by their employers' primary business category are as follows: 25% durable goods, 13% consumer goods, 5% financial services, 12% dp services, 7% educational institutions, 3% government offices, 8% wholesalers and retailers, and 21% miscellaneous. The large majority of the respondents were reporting the budgets for their employers' headquarters dp organizations.

The mean gross 1984 revenue of the respondents was about $200 million in 1984, and the average site's dp spending in 1985 is expected to exceed $452,000, a 7.4% increase over last year. The nominal mean dp expenditure in the most recent survey is not comparable to the prior year's survey owing to different methodology and sampling techniques employed.

Dp spending patterns vary widely, by type of industry as well as size of company. The mean revenue range was from $15 million to $516 million, while the mean dp budget range was $98,000 to $713,000. The 1984 mean annual revenue for the Fortune firms was $426 million and their mean annual dp spending was $752,000, with a range of from $175,000 for a utility to $1 million for the 13 Fortune-sized dp services firms responding to the survey. The Fortune firms responding to the survey indicated an average dp spending increase this year compared to 1984 of 8.3%, slightly larger than the increase expected by the group as a whole.

—Larry Marion

dustry seems to allocate the biggest portion of its average dp budget to datacom while educational users allocate the least.

DATACOM TO GROW SLIGHTLY

"Data communications was responsible for all our growth in most business applications," says Prehoda at American Sterilizer, noting that the company currently has some 650 IBM 3270-type terminals connected from remote sites to the Erie data center's mainframes. Many pcs at the company will be attached to the mainframes as asynchronous and 3270-like devices via software called Tempus, which helps define IBM PC-like diskette files on mainframe disks and enables PC users to manipulate them with standard PC commands.

Asked if they had standardized on particular microcomputer applications software packages, dp managers at all sizes of companies were divided almost fifty-fifty. Of those that had standardized, the most popular package was, not surprisingly, Lotus Development Corp.'s 1-2-3, the integrated spreadsheet program. Among the 49% of large, Fortune-class users that had standardized, just over three quarters had picked Lotus, while among the total sample, closer to one half had picked it.

The organizations most likely to have standardized on micro applications software were found to be consumer goods manufacturers, banks and other financial services organizations, and educational institutions. The least likely were medical and legal services companies.

Lotus 1-2-3 was followed by WordStar and dBase II/III as the most popular pc corporate applications package. Lotus's Symphony package was mentioned as first pick by only 8.8% of all respondents and 12.2% of the Fortune-class respondents.

As for micro-to-mainframe links—software that extracts and downloads host files to pcs—usage was found to be much higher among large users. Of the Fortune-type users, just over two fifths had such software installed, while only 27% of the entire survey population had them running. The most popular link software was that sold by On-Line Software, a GE subsidiary, followed by packages from Cullinet and McCormack & Dodge. ●

The 1985 DATAMATION budget survey is for sale in report form. It contains 250 pages of statistics and an executive summary prepared by the Market Research Department, covering 642 dp sites in 12 industry categories and including spending priorities for 16 dp budget items. A single copy is $100. For more information, contact Laurie Schnepf, Research Director, Technical Publishing, 875 Third Ave., New York, NY 10022, or call (212) 605-9679.

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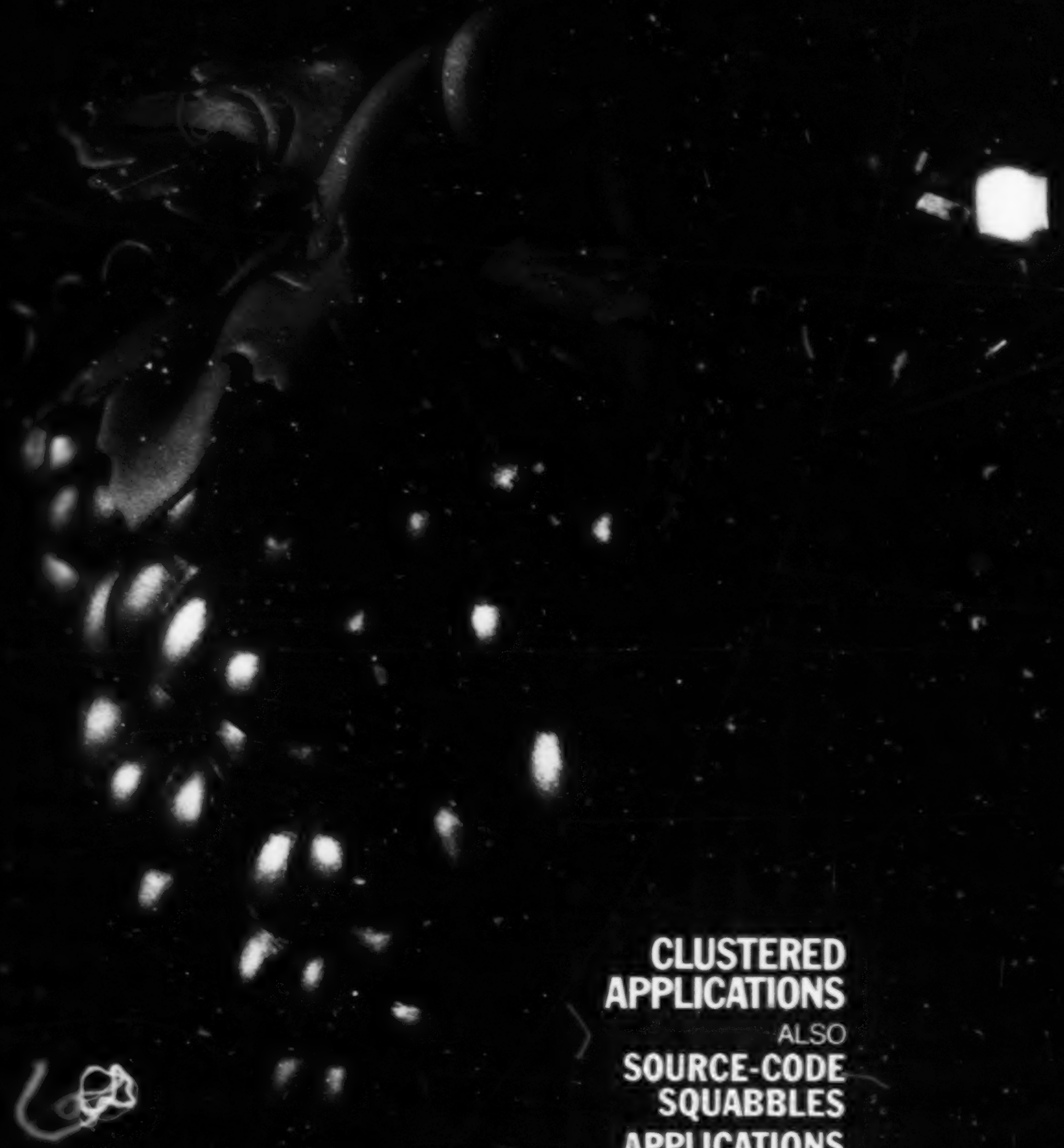

CLUSTERED APPLICATIONS

ALSO

SOURCE-CODE SQUABBLES

APPLICATIONS SOFTWARE SURVEY

DEPARTMENTAL COMPUTING STRATEGIES

DATAMATION

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FEATURES

24
IN FOCUS

Mail-order companies rely on an array of state-of-the-art computer systems to deliver "Wish Book Wonders" to their customers, reports Jessica Schwartz.

76
ADVENT OF THE CLUSTERED SYSTEM
Larry Welke

Life with clustered software systems is easy; figuring out which integrated software packages are truly integrated is not.

86
DEPARTMENTAL COMPUTING: A CHOICE OF STRATEGIES
Omri Serlin

The decision to implement a multiuser system or a pc network should be application-driven, not technology-driven.

100
IMNET TAKES THE FIELD
Tom Lawton

By teaming up with Merrill Lynch, IBM may be scheming to assume a major role in the distribution of financial market information.

111
BREAK WITH TRADITION
Robin E. Spock

Hurtle into the future with structured system development.

118
THE APPLICATIONS SOFTWARE SURVEY
Data Decisions

Some 4,000 users expressed great satisfaction with their business mainframe and minicomputer applications software, with highest marks for business management and forecasting packages. More than a third were end users who access their applications directly—representing an accelerating trend.

NEWS IN PERSPECTIVE

34 **SOFTWARE**
Dissent in the ranks.
36 **MAINFRAMES**
Is the door open?
With a little help.
50 **MANUFACTURING**
R2D2 meets Goodwrench.
61 **MICROCOMPUTERS**
David whips Goliath.
64 **SHAKEOUT**
Business as unusual.
72 **BENCHMARKS**

DEPARTMENTS

9 **LOOK AHEAD**
15 **LETTERS**
21 **EDITORIAL**

143 **PEOPLE**
149 **HARDWARE**
155 **SOFTWARE**
161 **SOURCE DATA**
169 **READERS' FORUM**
175 **MARKETPLACE**
176 **ADVERTISERS' INDEX**

INTERNATIONAL 72-1

-2 **IN SEARCH OF SOFTWARE**
-4 **COPING WITH THE SHORTAGE**
-13 **JAPAN'S SOFTWARE SQUEEZE**

3-D COVER ILLUSTRATION BY KATHY JEFFERS/PHOTOGRAPH BY WALTER WICK

No matter how you slice it, users give good grades to their vendors and packages.

THE APPLICATIONS SOFTWARE SURVEY

by Data Decisions

Application software packages are good and getting better, but all of them need a bit of tailoring from user to user. It's almost become a rule of thumb that 85% of the content of a good package can be used right away and the rest has to be modified to fit a particular situation, according to 50 dp managers contacted by DATAMATION as part of the Annual Applications Software Survey done in conjunction with the computer consulting and analysis firm, Data Decisions, Cherry Hill, N.J.

Whether the modification is done by the customer or by the vendor, and how extensively the modifications have been specified and how easily they can be implemented, become the key factors in whether a customer thinks he or she has a good or a poor product, and therefore color the responses in the poll. Other factors—such as whether the vendor promised more than could be delivered or whether the customer thinks the software is of good value—are becoming less significant, according to the 4,020 users who were asked to rate business mainframe and minicomputer applications packages. Only 6% of the respondents said they received "poor" value and only 3% said their packages didn't meet the vendors' promises. When it came to rating vendor-supplied services like responsiveness, training, and documentation, the level of satisfaction declined.

Asked to rate vendor services on an ascending scale of one to 10, the score averaged 5.9. That compared with a rating of 6.5 in terms of overall satisfaction with the average package. Keep in mind that the "average" blends the results of a wide variety of packages together. Even the averages within one product category are not absolute, because of differences in the products (see "What the Charts Say and Don't Say," p. 126).

Just as there are no perfect 10s in real life, so is it in software. The highest-scoring product, an account reconciliation package developed by Disc Inc., Baltimore, received a 7.8. A total of 97 packages developed by 50 vendors were rated. Because of space limitations and the limited number of responses to some of the less widely used vertical market applications, only the ratings charts for 53 general accounting, payroll/personnel, and business management and forecasting packages are included here (see "Methodology," p. 120 for more information).

The relatively low score for vendor services may be attributable to that 15% content in general purpose packages that users say must be tailored to fit their unique environments and the heavy demands that such tailoring places on vendors' support capabilities. As more end-user departments begin to acquire software packages without going through the data processing department, inexperienced users may be expecting more from the vendor than the maintenance fees—usually 8% to 15% of the license price—justify, although many data processing managers try to curtail such action by giving users more access to the products while keeping the maintenance of the packages within their domain. More than a third, 38%, taking part in the study were end users who access their applications directly, while only 14% said their access was controlled by data processing.

This is a rapidly accelerating trend. "While only a few years ago we had 100 people in the dp department doing data entry, it's now down to 25 and our goal is zero," says Hal Danowitz, information systems manager with the City of Los Angeles. He adds, though, that while end users have access to the applications, data processing will retain responsibility for maintenance and data security.

Companies are structuring their planning to encourage such delineation of responsibility. Pennwalt Pharmaceuticals, Rochester, N.Y., brought together a committee representing 10 levels of user interests when it decided to go outside to acquire an MRP package. The evaluation procedure lasted 18 months. "By that time, we knew clearly what should be specified to the vendor and where responsibilities started and ended," says William R. Brown, the company's dp director. "And dp only had a one-tenth say in the matter."

Too many users tend to select packages simply because they look good, contends Arnold Adams, corporate director of dp at Charles T. Main Inc., Boston. "In doing it this way, they aren't specifying what they're looking for in a product. A well-thought-out specification definition is essential in selecting such software," says Adams.

This is especially the case in selecting business management and forecasting packages, those most often accessed directly. In this study, 54% of the users were found to have direct access to them, reflecting a growing demand by management personnel for end user-oriented decision support software to help with planning, profit estimating, and expense control.

CONCERNS OF THE BUYERS

What determines a customer's overall satisfaction? In this study the respondents were asked to rate their software according to four concerns—performance, operations, I/O functionality, and vendor support. Their performance rating is a composite based on factors like efficiency of hardware utilization, ease of use, level of program errors, and the amount of time necessary to install the system.

Business management and forecasting packages received the highest rating for both performance (6.5) and vendor support (6.3). The average rating in all the groups was 6.1 for performance and 5.9 for vendor support. Older packages, such as personnel software with a 5.8 rating, scored lowest for vendor support, but scored highest for performance with a rating of 6.6. Performance ratings were based on features such as recovery/backup facilities, security provi-

ILLUSTRATION BY JULIAN GRADDON

"Vendors don't lie anymore because the packages are too widely used."

sions, ability to handle expanded processing volumes, and compatibility with other software.

The average rating for I/O operations was 6.0. Users were asked to judge data entry provisions, prescribed output formats and procedures, and how quickly and easily format changes could be made.

Many data processing professionals who were asked to comment on the results of this study said applications software is getting better because so many of the people writing it used to work in the user community and are keenly aware of the productivity requirements. That might explain why an impressive 53% of the respondents said they'd received "good" value, and 36% said they'd actually received "excellent" value. Only 6% felt they had received "poor" value.

A package was judged to be excellent if it provided good or excellent capabilities at or below competitive prices. Good value meant that it provided good or excellent features at slightly higher than competitive prices or that if it indeed had minor shortcomings, its price still was lower than its competitors'. A package would be considered a poor value by the respondents if its price was either significantly higher than competitive packages or if it lacked important capabilities but was priced comparable to or higher than competitors.

NO MORE FALSE PROMISES

With very few exceptions, customers are getting what they order; salesmen with false promises have been weeded out of the industry. "Vendors don't lie anymore because the packages are too widely used," explains Arnold Zweig, manager of technical services at the forest products firm, Crown Zellerbach, San Francisco.

"We may be increasing in numbers, but we're still a closely knit community, and we ask each other about salesmen's unfilled promises," adds Adams of Charles T. Main.

Asked in this study whether vendors kept their promises, 85% said they did and 65% even said their acquisitions met or exceeded vendor promises in all categories, including performance, speed, efficiency, and installation time. Again, the greatest satisfaction was shown for business management and forecasting packages, where 72% said vendor promises were met or exceeded.

Commenting on the 3% who said their acquisitions didn't meet any of the vendor's promises, Joseph M. Yaeger, director of data processing at the Cook County Bureau of Administration in Chicago, wonders if many of these disappointments weren't self-inflicted by vague specifications. "It's not that easy to change your system to do what the package does."

While nearly all of the 4,020 respondents use more than one kind of vendor support, the most popular was the telephone hot line, followed by mail, on-site support, and on-line hookup. On an ascending satisfaction scale of one to 10, on-site support was rated the highest with an average of 6.6, followed by telephone hot line, 6.2; on-line support, 5.8; and mail support, 5.6.

Data Decisions detected a growing need, especially among owners of business management and forecasting products, to keep abreast of new packages. One in six users, or 17%, reported they have evaluated competitive products since first buying a package but few (one in seven) were actively seeking replacement packages.

The proliferation of software packages and enhancements to them, and the growing participation by end users in their selection, have spurred many data processing organizaions—certainly the larger ones—to set up formal mechanisms to review new software offerings. "You don't fall into good software by accident," ob-

METHODOLOGY

The 1985 Data Decisions Applications Software Survey is made up of application software packages sold by independent software developers cited by International Computer Programs, Indianapolis, as having generated $5 million in sales as of the publication date of its directory last year. To obtain a reasonable-sized sample, the 115 vendors whose products qualified for inclusion in the directory were asked to submit a list of 125 of their most recent customers, or their entire customer file when fewer than 125 customers used the package. They were asked not to contact these customers with regard to the survey and respondents also were asked whether they were contacted by the vendor.

Each vendor received a registered letter and two follow-up phone calls. Altogether, those who cooperated provided lists for 92 different packages, although the number was later reduced to 83 when nine packages contained fewer than 29 customer names. In addition, the names of users of 16 of the most widely used packages from vendors who didn't cooperate were obtained from the directory of Computer Intelligence, La Jolla, Calif. That increased the total number of packages surveyed to 99.

In late August, 7,782 questionnaires were mailed and 3,931 were returned for a net response of 51%. To provide a minimum response rate of 40% and a minimum user base of 15 for each package, 89 telephone interviews were conducted, bringing the total number of responses to 4,020. This figure included 536 respondents who indicated that the package was not currently being used at their installation. For the purposes of this printed excerpt from the survey, only packages with 25 or more respondents were included.

The survey was designed by Data Decisions and conducted by Beta Research Corp., Syosset, N.Y.

AVERAGE TOLERANCES FOR 68% CONFIDENCE LEVEL

	OVERALL SATISFACTION			SPECIFIC ATTRIBUTE RATINGS			
Sample Size	6.0 or Under	7.0	8.0 or Higher	5.0 or Under	6.0	7.0	8.0 or Higher
60 or more	.25	.20	.15	.35	.30	.25	.20
50–59	.25	.25	.20	.35	.30	.30	.25
40–49	.30	.25	.20	.35	.30	.30	.25
30–35	.30	.30	.25	.35	.35	.35	.35
15–29	.40	.40	.35	.50	.50	.45	.40

As in all sample surveys, the numbers reported are estimates within a range of what would have been obtained if the entire universe had been queried. The margins of sampling variation, or tolerances, for both the overall ratings and for ratings of specific attributes are given above. These tolerances range from .25 to .5. This means that the chances are approximately 2 in 3 that a reported rating differs by no more than the indicated tolerance from the rating that would have been obtained if all eligible sites had been surveyed. For example, if a sample of 30 sites gives a package an overall satisfaction rating of 7.0, the table indicates a tolerance of 0.30 on this estimate. Thus, the chances are 2 in 3 that the interval 6.70–7.30 includes the rating that would have been obtained if all eligible sites had been surveyed.

Frequently there's a pattern to the ratings—all of a company's products perform at about the same level.

serves Tom Murray, director of information system development at the Del Monte Corp., San Francisco. At that company, a group consisting of data processing staff and end users constantly probes all sources of new product information, such as publications, catalogs, and vendor seminars, and then issues competitive evaluations on the products, he says.

Among the respondents seeking alternative packages, 40% were doing so because the installed system didn't meet their current needs. Another 33% listed other reasons like changing computer vendors, 20%; upgrading to an incompatible product by the same vendor, 13%; general dissatisfaction, 20%; or dissatisfaction with execution speed, 13%. A small group, 13%, thought that the cost of upgrading their existing system was too high and thus were opting for a replacement.

Four major factors on which customers base their buying decisions include features and capabilities, cited by 81%; productivity and ease of use, 52%; vendor's reputation, 47%; and compatibility, 36%. Among the least important factors were experience with other packages from the same vendor, 19%, and advice from consultants or third parties, 14%.

In making those decisions, 71% had evaluated other packages, either from their computer hardware vendor, 19%, or from independent software suppliers, 66%. In evaluating independents' products, an average of 3.7 packages were studied.

OLDER PRODUCTS PREFERRED

The study also turned up a preference among many users for older products that worked, rather than for packages that incorporated the latest features. Even though the average package surveyed had been in use for 40 months, about one out of three respondents said they weren't using the latest version of a product. But 59% said they were; 5% weren't sure.

Those who weren't using the latest versions might agree with the comment by Michael Bilotti, vice president of management information systems with the retail chain Zayre Corp., Framingham, Mass. "If a package is filling a need, why look for something else?" he asks.

Frequently a vendor tailors a version of an application package to a specific user environment. As long as it performs to specifications, why should the user spend the time and money to customize a more current version, especially one that solves problems not encountered or provides enhancements not needed at the installation?

An exception to this trend were the users of business management and forecasting packages. Seventy-six percent of these users were running with the latest version.

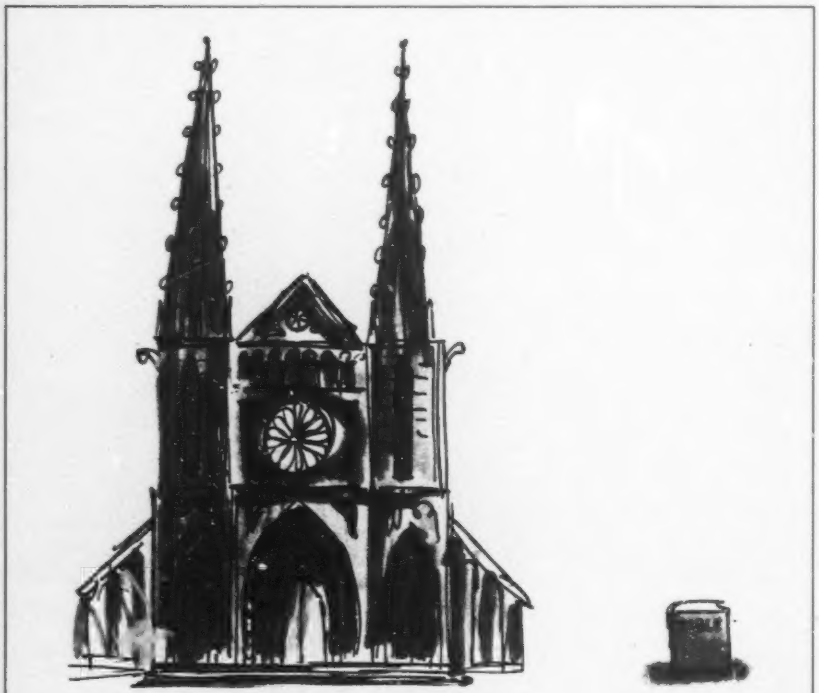
Seventy percent of the respondents said they run their programs under IBM operating systems, 67% on IBM machines and the rest on systems from Amdahl or National Advanced Systems. Digital Equipment Corp. machines were a distant second with 6% of the user base, followed by Hewlett-Packard with 4%, Wang with 3%, and a group of other vendors (Burroughs, Honeywell, Sperry, Texas Instruments, and Prime) each averaging 1% or slightly more.

Many of the packages that were rated in this study are products of long-established software developers, such as Management Science America Inc., Applied Data Research Inc., UCCEL (formerly Wyly Corp.), McCormack & Dodge, and Software International, companies whose annual revenues last year ranged from $30 million all the way up to more than $100 million.

In some cases, however, customers are giving good marks to newer offerings. Among these are four general accounting packages from Walker Interactive Products, San Francisco, whose general ledger package, II/GL (for Integrated Interactive), scored comfortably higher than the average rating for these products, though the fact that the packages received ratings from fewer than 25 respondents should be noted. The other three are packages for materials management, accounts payable, and purchase orders.

Customers show an increasing interest in using integrated products like those offered by Walker because they handle accounting functions more rapidly than products that merely interface to each other. In an integrated package, a change mode on one module of an accounting package causes necessary changes to be made simultaneously in other modules. This integrated approach, however, means that some products are not directly comparable to others in a particular category.

Some patterns can be detected in the general quality of vendor offerings. Eight of 10 packages from MSA scored above average, including its Human Resource System



CARTOON BY HENRY MARTIN

Companies are structuring their planning to encourage delineation of responsibility.

and Payroll Accounting packages, which were rated number one in the category of payroll/personnel with the high score of 7.4 each.

While Software International's general ledger and financial reporting package was tied for second place with MSA in the general accounting packages category, three others of its packages—accounts receivable, fixed asset accounting, and payroll/personnel—were ranked below 5 on the 1-to-10 scale. Its accounts payable did a little better, getting a 6.4 rating, just under the 6.5 average in the general accounting group of packages.

A summary of ratings received by 53 applications packages and bar charts showing how some of them performed against the average rating for a given group follows. An asterisk after a product indicates it was rated by fewer than 25 users and thus isn't represented by a corresponding bar chart in this excerpt, though its ratings are available from Data Decisions.

WHAT THE CHARTS SAY AND DON'T SAY

There is no such thing as a summa cum laude in software ratings. These results should not be taken as gospel. Because only the best-selling products were rated, the packages in this survey by no means represent a broad cross section of products and users, and it's even possible that the best product on the market may be absent. In particular, products introduced last year were omitted because they were new and didn't have high enough sales figures to be included in the directory used as the foundation of the survey. Or, the hot package everyone talks about at Data Processing Managers Association meetings is only now being shipped in large quantities, and there weren't enough users to poll for a statistically valid rating.

Furthermore, to avoid many of the sins of omission as well as the sins of commission, this year's survey excerpt does not include vertical market packages such as banking, manufacturing, and other sectors. In some cases there were too few respondents or too few packages represented in a given category to get what DATAMATION considers a meaningful picture of real world experience; in other cases Data Decisions was not able to obtain a suitable number of users to question.

What the bar charts do indicate is a summary of the user ratings for 53 packages covering applications for general accounting, payroll/personnel, and business management and forecasting. Included are those packages that received ratings from 25 or more users.

Each chart shows the number of users reporting on the package, the percentage that judged the package and its vendor support to be outstanding; the percentage seeking to replace the package; and the percentage citing unsatisfactory performance as the reason for replacement. Next to each bar that shows the product's rating, in color, is a bar that shows the average rating for that group, in black. Bar charts that break out the ratings by their individual components are available for all 97 products in the full Data Decisions report on which the findings in this summary are based.

One factor to consider when reviewing these results is that there are no absolute evaluation standards that are relevant to all users and installations. Many of these packages are multipurpose tools but are categorized by their primary function. Since one man's DBMS may be another's program generator, the unavoidably subjective nature of the categorization precludes any definitive declaration of "best in its class." In some cases a product's function only partially resembles others in its "category."

Given these caveats, then, the reader should consider the results of this study as, at best, a useful first step in the product evaluation process. While the findings may reflect certain trends, they don't tell the whole story.

—Tom McCusker

Ratings Summary

GENERAL ACCOUNTING—
32 packages studied.

7.8—Disc Inc. DISC ARP
7.7—MSA General Ledger; Software International G/L & Financial Reporting; Timberline Systems MAC
7.6—McCormack & Dodge G/L Plus
7.4—Data Design Fixed Asset Accounting
7.3—MSA ALLTAX
7.2—McCormack & Dodge Fixed Assets Plus
7.1—MSA A/P & Purchasing; MSA A/R; MSA Fixed Assets
7.0—McCormack & Dodge A/P Plus
6.9—Walker II/GL*
6.7—Data Design A/P Purchase Control; Information Associates Financial Accounting
6.6—Consco Consolidation System; UCCEL FCS/FCO*
6.5—**Group Average**; Global Software G/L & Financial Reporting; Information Systems of America ISA/Accounting, Budget & Cost
6.4—Compro G/L System*; Software International A/P
6.3—Transcom TOLAS
6.1—Compro A/P System*; Global Software Accounts Payable*
6.0—Compro Fixed Assets*; MSA (formerly Computeristics) CUSTOMAR*; Walker II/MM*
5.9—UCCEL CARMS*
5.3—Walker II/AP*
4.7—Software International A/R; Walker II/PO*
4.2—Software International Fixed Asset Accounting

PAYROLL/PERSONNEL—
11 packages studied.

7.4—MSA Human Resource System, MSA Payroll Accounting
7.1—Cyborg Systems Payroll/Personnel
7.0—Genesys Software Payroll Accounting
6.9—Integral Systems Payroll/Personnel
6.8—MSA Personnel Management Reporting
6.6—**Group Average**; Gensys Personnel Management
6.5—Information Science Human Resource System
6.4—McCormack & Dodge Human Resource Plus
5.8—Information Associates Payroll Accounting
4.7—Software International Payroll/Personnel

BUSINESS MANAGEMENT & FORECASTING—
10 packages studied.

7.7—Cognos POWERHOUSE; SPSS Inc. SPSS Batch System
7.0—Execucom Corp. IFPS
6.9—Computer Associates AUTOTAB II*
6.7—**Group Average**
6.6—EPS Consultants FCS-EPS; MSA Forecasting & Modeling*
6.3—AGS Management PAC System
6.2—Applied Data Research ADR/EMPIRE; Compro FORESIGHT
6.1—Xerox Corp. Business Management System ◉

This survey is based on a forthcoming report in Data Decisions' *Software*, a monthly updated information service covering systems and applications software for mainframes and minicomputers. To order the full report, or for additional information on Data Decisions' subscription services and custom consulting capabilities, contact Data Decisions, 20 Brace Rd., Cherry Hill, NJ 08034. The telephone number is (609) 429-7100.

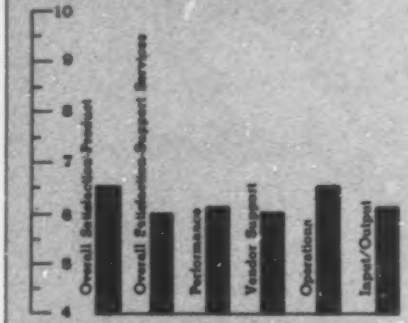
Ratings Values
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend
▬ Specific Product Rating
▬ Group Average Rating

☐ GENERAL ACCOUNTING

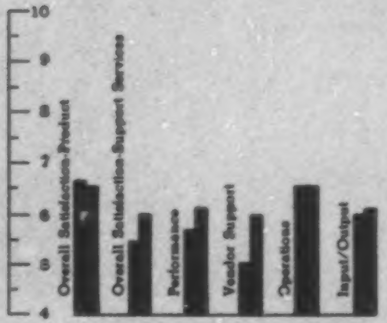
Group Average • 32 packages

1199 responses • 15% judged package and 12% judged vendor outstanding • 144 actively seeking to replace package, with 36 citing unsatisfactory performance as reason.



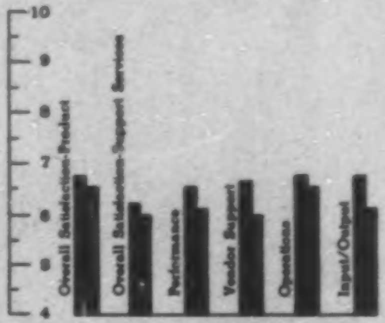
CONSOLIDATION SYSTEM • Conseco Enterprises, Inc., 400 Corporate Court, South Plainfield, NJ 07080 • 201-561-2111

30 responses • 13% judged package and 7% judged vendor outstanding • 5 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



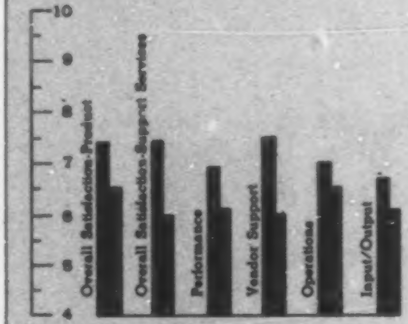
ACCOUNTS PAYABLE • Data Design Associates, Inc., 1250 Oakmead Parkway, Suite 310, Sunnyvale, CA 94086 • 408-730-0100

49 responses • 12% judged package and 6% judged vendor outstanding • 8 actively seeking to replace package, with 3 citing unsatisfactory performance as reason.



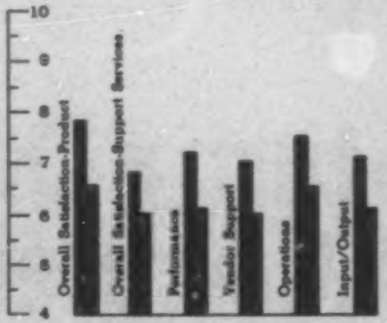
FIXED ASSET ACCOUNTING • Data Design Associates, Inc., 1250 Oakmead Parkway, Suite 310, Sunnyvale, CA 94086 • 408-730-0100

83 responses • 25% judged package and 34% judged vendor outstanding • 2 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



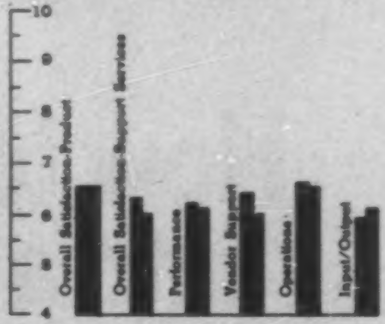
DISC ACCOUNT RECONCILIATION • Disc, Inc., 3837 Naylors Lane, Baltimore, MD 21208 • 301-486-0410

43 responses • 30% judged package and 16% judged vendor outstanding • 3 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



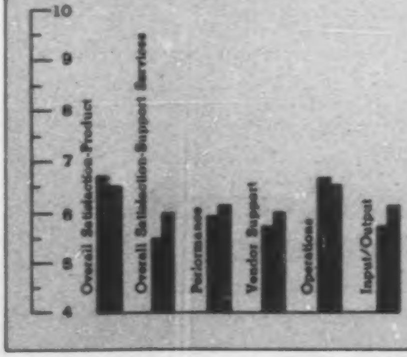
GENERAL LEDGER & FINANCIAL REPORTING • Global Software, Inc., 1009 Spring Forest Road, Raleigh, NC 27609 • 919-878-0710

44 responses • 5% judged package and 7% judged vendor outstanding • 8 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



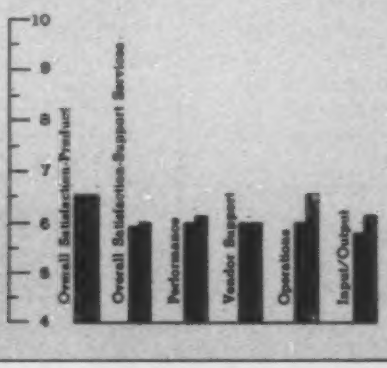
FINANCIAL ACCOUNTING • Information Associates, Inc., 3000 Ridge Road, East, Rochester, NY 14622 • 716-467-7740

28 responses • 11% judged package and 7% judged vendor outstanding • 5 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



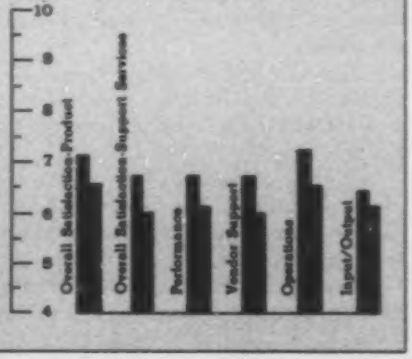
ISA/ACCOUNTING, BUDGET & COST • Information Systems of America, 500 Northridge Road, Atlanta, GA 30338 • 404-587-6800

46 responses • 7% judged package and 0% judged vendor outstanding • 4 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



ACCOUNTS PAYABLE & PURCHASE ORDER • Management Science America, Inc. (MSA), 3445 Peachtree Road, N.E., Atlanta, GA 30326 • 404-262-2376

84 responses • 19% judged package and 17% judged vendor outstanding • 6 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



Ratings Values

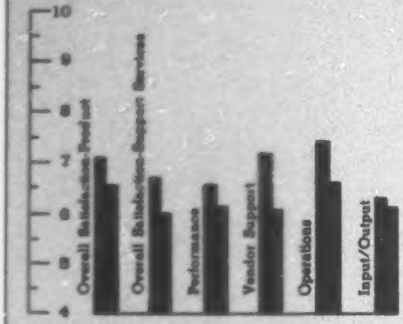
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▬ Group Average Rating

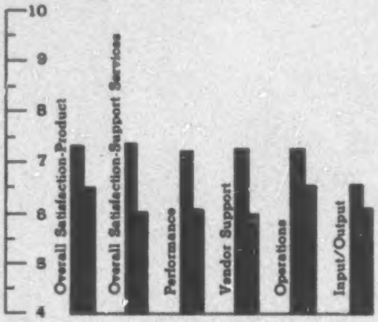
ACCOUNTS RECEIVABLE • Management Science America, Inc. (MSA), 3445 Peachtree Road, N.E., Atlanta, GA 30326 • 404-262-2376

80 responses • 18% judged package and 20% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



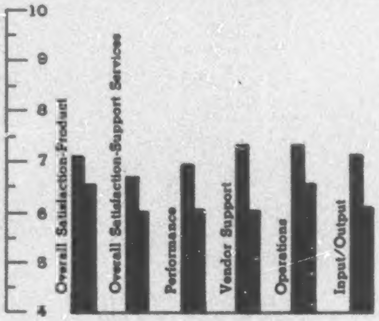
ALLTAX • Management Science America, Inc. (MSA), 3445 Peachtree Road, N.E., Atlanta, GA 30326 • 404-262-2376

47 responses • 17% judged package and 21% judged vendor outstanding • 10 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



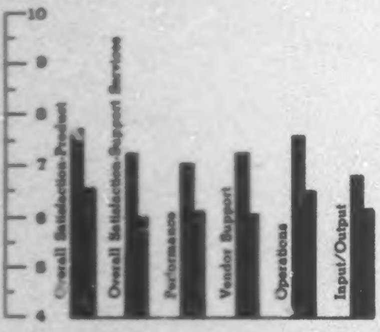
FIXED ASSETS • Management Science America, Inc. (MSA), 3445 Peachtree Road, N.E., Atlanta, GA 30326 • 404-262-2376

61 responses • 16% judged package and 13% judged vendor outstanding • 3 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



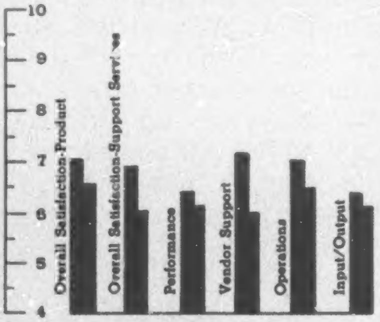
GENERAL LEDGER • Management Science America, Inc. (MSA), 3445 Peachtree Road, N.E., Atlanta, GA 30326 • 404-262-2376

82 responses • 26% judged package and 23% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



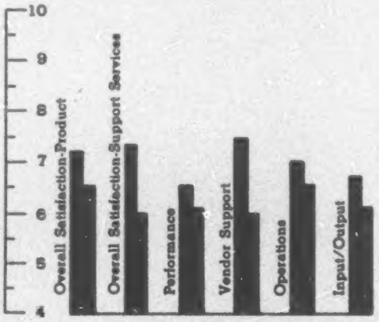
ACCOUNTS PAYABLE PLUS • McCormack & Dodge, 1225 Worcester Road, Natick, MA 01760 • 617-651-1010

56 responses • 21% judged package and 21% judged vendor outstanding • 3 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



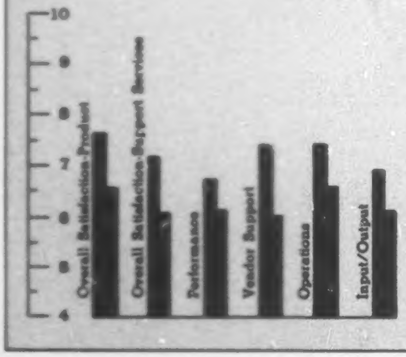
FIXED ASSETS PLUS • McCormack & Dodge, 1225 Worcester Road, Natick, MA 01760 • 617-651-1010

58 responses • 17% judged package and 24% judged vendor outstanding • 4 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



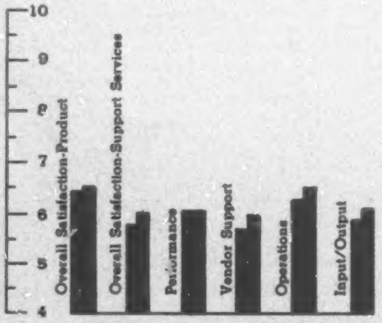
GENERAL LEDGER PLUS • McCormack & Dodge, 1225 Worcester Road, Natick, MA 01760 • 617-651-1010

62 responses • 29% judged package and 26% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



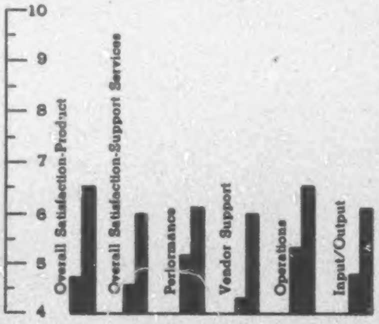
ACCOUNTS PAYABLE • Software International Corp., One Tech Drive, W. Andover, MA 01810 • 617-685-1400

6[illegible] responses • 8% judged package and 3% judged vendor outstanding • 2 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



ACCOUNTS RECEIVABLE • Software International Corp., One Tech Drive, W. Andover, MA 01810 • 617-685-1400

38 responses • 6% judged package and 6% judged vendor outstanding • 9 actively seeking to replace package, with 7 citing unsatisfactory performance as reason.



Ratings Values

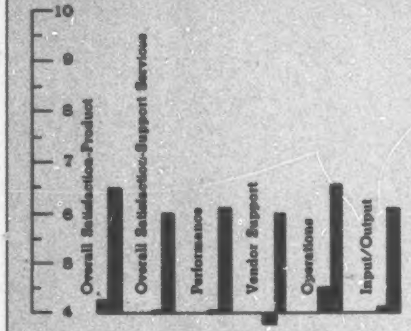
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▬ Group Average Rating

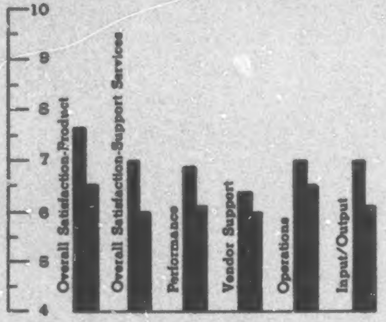
FIXED ASSET ACCOUNTING • Software International Corp., One Tech Drive, W. Andover, MA 01810 • 617-685-1400

46 responses • 2% judged package and 2% judged vendor outstanding • 10 actively seeking to replace package, with 9 citing unsatisfactory performance as reason.



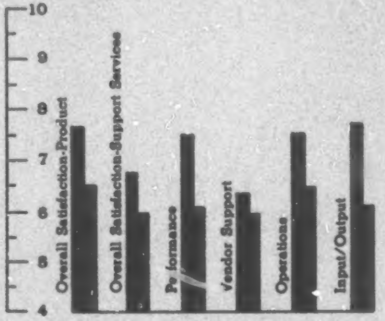
GENERAL LEDGER & FINANCIAL REPORTING • Software International Corp., One Tech Drive, W. Andover, MA 01810 • 617-685-1400

67 responses • 30% judged package and 16% judged vendor outstanding • 3 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



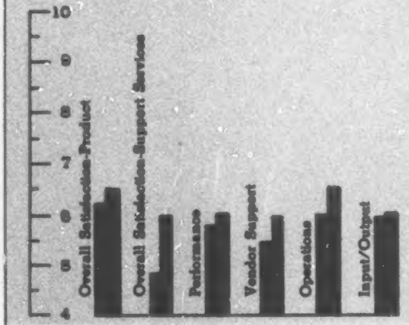
MANAGEMENT ACCOUNTING FOR CONSTRUCTION • Timberline Systems, Inc., 7180 Fir Loop, Portland, OR 97223 • 503-684-3660

43 responses • 40% judged package and 23% judged vendor outstanding • 3 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



TOLAS • Transcomm Data Systems, Inc., 1380 Old Freeport Road, Pittsburgh, PA 15238 • 412-963-6770

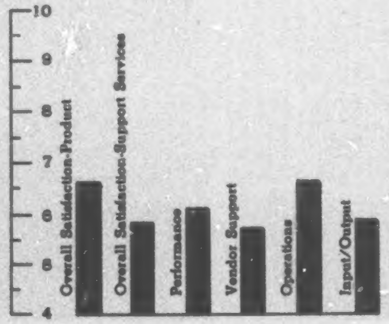
27 responses • 19% judged package and 7% judged vendor outstanding • 8 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



☐ PAYROLL/PERSONNEL

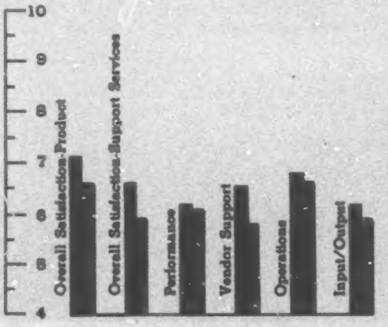
Group Average • 11 packages

489 responses • 13% judged package and 8% judged vendor outstanding • 68 actively seeking to replace package, with 20 citing unsatisfactory performance as reason.



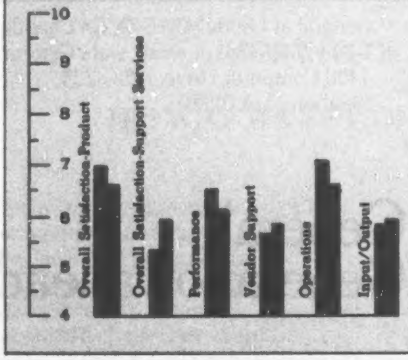
PAYROLL/PERSONNEL • Cyborg Systems, Inc., 2 N. Riverside Plaza, Suite 2160, Chicago, IL 60606 • 312-454-1865

69 responses • 22% judged package and 17% judged vendor outstanding • 5 actively seeking to replace package, with 3 citing unsatisfactory performance as reason.



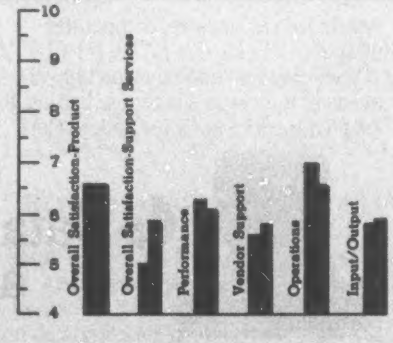
PAYROLL/ACCOUNTING • Genesys Software Systems, Inc., 20 Ballard Way, Lawrence, MA 01843 • 617-685-5400

47 responses • 19% judged package and 6% judged vendor outstanding • 12 actively seeking to replace package, with 3 citing unsatisfactory performance as reason.



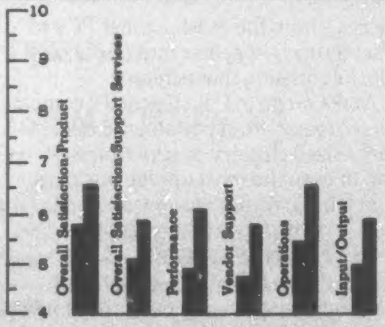
PERSONNEL MANAGEMENT • Genesys Software Systems, Inc., 20 Ballard Way, Lawrence, MA 01843 • 617-685-5400

32 responses • 16% judged package and 3% judged vendor outstanding • 6 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



PAYROLL ACCOUNTING • Information Associates, Inc., 3000 Ridge Road, East, Rochester, NY 14622 • 716-467-7740

26 responses • 8% judged package and 0% judged vendor outstanding • 6 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



Ratings Values

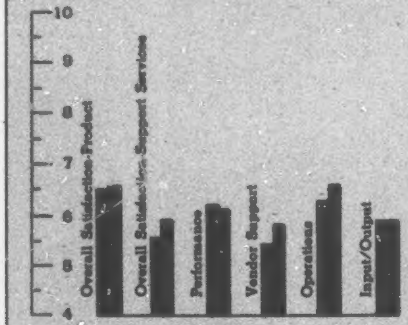
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▬ Group Average Rating

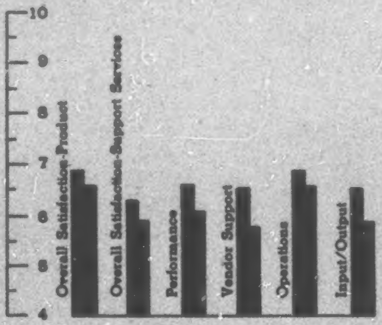
HUMAN RESOURCE SYSTEM (HRS) • Information Science, Incorporated, 95 Chestnut Ridge Road, Montvale, NJ 07645 • 201-391-1600

39 responses • 3% judged package and 0% judged vendor outstanding • 5 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



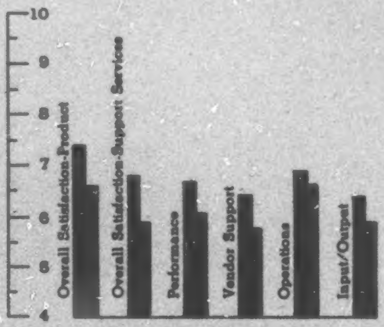
PAYROLL/PERSONNEL • Integral Systems, Inc., 165 Lennon Lane, Walnut Creek, CA 94598 • 415-939-3900

86 responses • 16% judged package and 11% judged vendor outstanding • 3 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



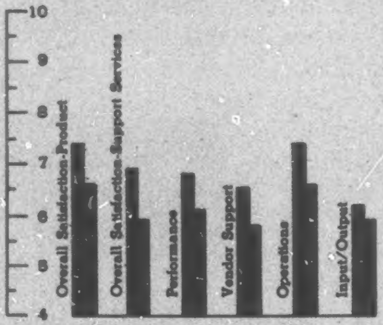
HUMAN RESOURCES SYSTEM • Management Science America (MSA), 3445 Peachtree Road, N.E., Atlanta, GA 30326 • 404-262-2376

41 responses • 20% judged package and 10% judged vendor outstanding • 0 actively seeking to replace package.



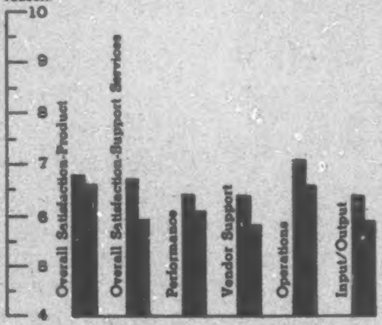
PAYROLL ACCOUNTING SYSTEM • Management Science America (MSA), 3445 Peachtree Road, N.E., Atlanta, GA 30326 • 404-262-2376

56 responses • 21% judged package and 14% judged vendor outstanding • 4 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



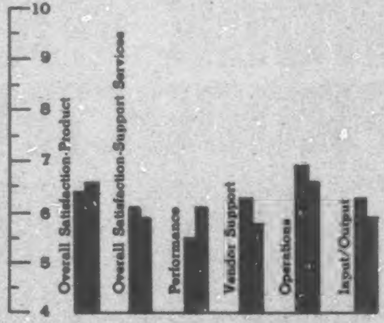
PERSONNEL MANAGEMENT & REPORTING SYSTEM • Management Science America (MSA), 3445 Peachtree Road, N.E., Atlanta, GA 30326 • 404-262-2376

83 responses • 11% judged package and 11% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



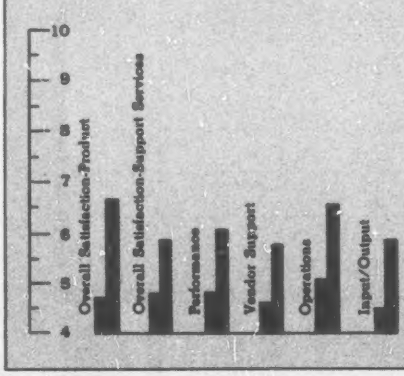
HUMAN RESOURCES PLUS • McCormack & Dodge, 1225 Worcester Road, Natick, MA 01760 • 617-651-1010

26 responses • 8% judged package and 12% judged vendor outstanding • 4 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



PAYROLL/PERSONNEL • Software International Corp., One Tech Drive, W. Andover, MA 01810 • 617-685-1400

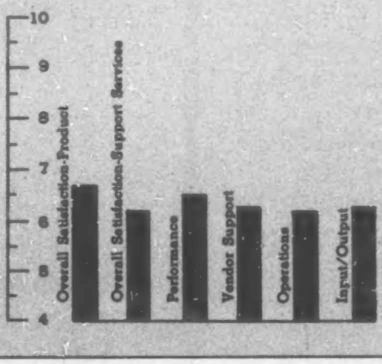
43 responses • 5% judged package and 2% judged vendor outstanding • 14 actively seeking to replace package, with 8 citing unsatisfactory performance as reason.



☐ BUSINESS MANAGEMENT & FORECASTING

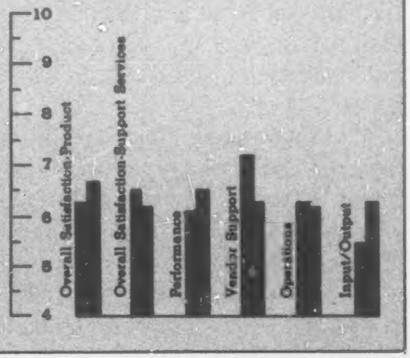
Group Average • 10 packages

413 responses • 16% judged package and 15% judged vendor outstanding • 78 actively seeking to replace package, with 17 citing unsatisfactory performance as reason.



PAC SYSTEM • AGS Management, 880 First Avenue, King of Prussia, PA 19406 • 215-265-1550

61 responses • 15% judged package and 23% judged vendor outstanding • 8 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



Ratings Values

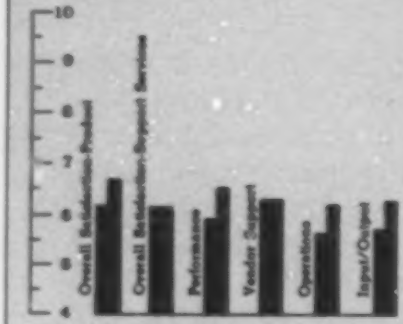
10-9: Superior
8-6: Very Good
5-3: Acceptable
2-1: Inadequate

Legend

▬ Specific Product Rating
▬ Group Average Rating

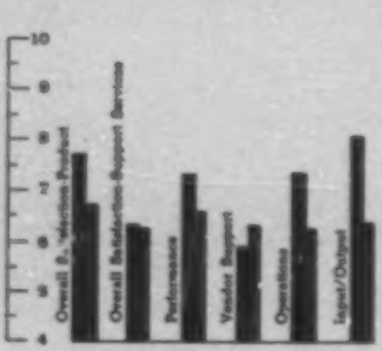
ADR/EMPIRE • Applied Data Research, Inc., Route 206 & Orchard Road, Suite CN-8, Princeton, NJ 08540 • 201-874-9000

39 responses • 13% judged package and 15% judged vendor outstanding • 10 actively seeking to replace package, with 5 citing unsatisfactory performance as reason.



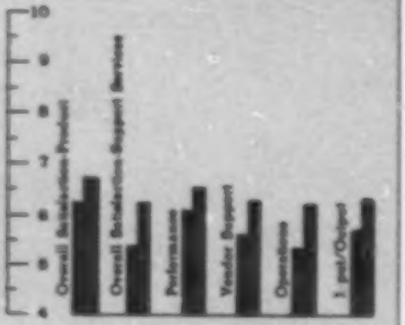
POWERHOUSE • Cognos Corp., 1801 Oakland Boulevard, Suite 100, Walnut Creek, CA 94596 • 415-943-7277

40 responses • 25% judged package and 10% judged vendor outstanding • 2 actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



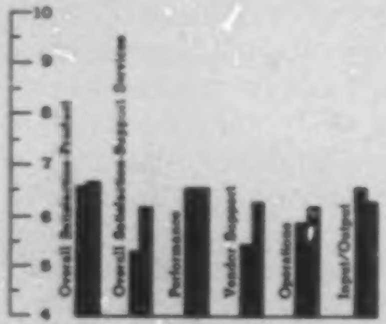
FORESIGHT • Compro Financial Systems, Inc., 2080 Peachtree Industrial Court, Suite 114, Atlanta, GA 30341 • 404-455-1943

46 responses • 10% judged package and 2% judged vendor outstanding • 18 actively seeking to replace package, with 4 citing unsatisfactory performance as reason.



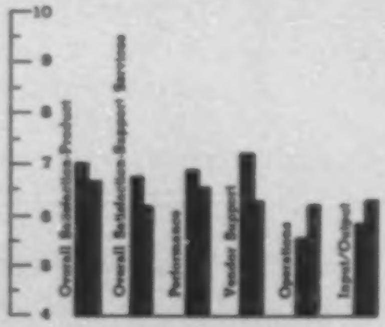
FCS-EPS • EPS Consultants, One Industrial Drive, Windham, NH 03087 • 603-898-1800

59 responses • 17% judged package and 5% judged vendor outstanding • 9 actively seeking to replace package, with 3 citing unsatisfactory performance as reason.



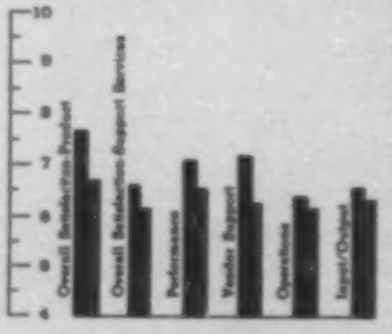
IFPS • Execucom Corp., P.O. Box 9758, Austin, TX 78766 • 512-346-4980

29 responses • 21% judged package and 17% judged vendor outstanding • 7 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



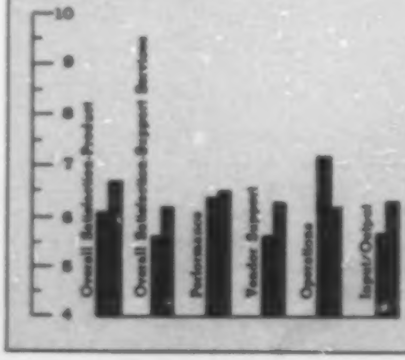
SPSS BATCH SYSTEM • SPSS, Inc., 444 N. Michigan Ave., Suite 3000, Chicago, IL 60611 • 312-329-2400

59 responses • 29% judged package and 20% judged vendor outstanding • 12 actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



BUSINESS MANAGEMENT SYSTEM • Xerox Corp., 5310 Beethoven Street, Los Angeles, CA 90066 • 213-306-4000

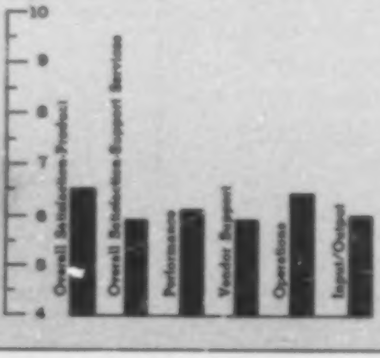
36 responses • 11% judged package and 14% judged vendor outstanding • 16 actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



■ OVERALL SUMMARY

Average—All Packages • 97 packages

3,472 responses • 13% judged package and 11% judged vendor outstanding • 521 actively seeking to replace package, with 104 citing unsatisfactory performance as reason.



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DATAMATION.

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EXPLORING THE SIERRAS

ALSO

DATABASE MACHINES TAKE OFF

IN FOCUS: THE MAINFRAME USER SURVEY

UP THE SOFTWARE CURVE

DATAMATION

MAY 15, 1985/$3.00 U.S.
VOLUME 31 NUMBER 10
This issue, 191,350 copies

FEATURES

32
IN FOCUS

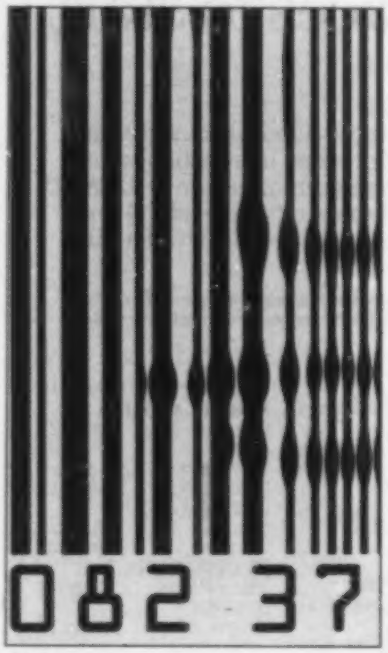
Surprise! IBM is gaining significantly against traditional systems rivals and is well ahead of the pack rushing to market with office systems, pcs, and other forms of distributed processors. John W. Verity reports on this year's DATAMATION/Cowen & Co. survey of user mainframe spending in "Up, Up, and Away."

84
SIERRA: WHERE WILL IT LEAD?
Norman Weizer

The next few years will tell us whether or not the road down which IBM is taking its mainframe users is paved with good intentions.

96
UP THE SOFTWARE CURVE
Bob Djurdjevic

IBM discovers equilibrium. Increasing software revenues will counterbalance declining hardware revenues.



108
YOU KNOW MY NAME, LOOK UP THE NUMBER
Robert Ellis Smith

Dp's accelerating progress has rendered almost moot the controversy over use—and misuse—of social security numbers.

119
IS YOUR COMPUTER INSECURE?
Joel S. Zimmerman

Build up its confidence—and yours—by challenging the principle of "cost-effective" system security.

132
PAINTING A NEW PICTURE
Frank Sweet

The impact of data-driven prototyping on on-line screen design is transforming the way dpers develop mainframe applications.

167
READERS' FORUM

Barbara Bialick tells a philosophical tale in "Girdle, Etcher, Bozo."

NEWS IN PERSPECTIVE

46 **MAINFRAMES**
Phantom of the future?
Too little, too late?

52 **DBMS**
Database machines take off.

63 **FAULT TOLERANT**
The FT crowd.

65 **SOFTWARE**
The new game in town.

71 **MICROCOMPUTERS**
Of mice and Xerox.

78 **BENCHMARKS**

79 **WORLD WATCH**

DEPARTMENTS

8 **LOOKING BACK**
13 **LOOK AHEAD**
18 **CALENDAR**
23 **LETTERS**
29 **HARDCOPY**

145 **HARDWARE**
153 **SOFTWARE**
160 **MARKETPLACE**
162 **ON THE JOB**
176 **ADVERTISERS' INDEX**

OEM SUPPLEMENT 80-I

-2 **PROTOCOL CONVERSION WARMS UP**
-9 **DICKERING FOR DOLLARS**
-13 **PICTURES FROM PCS**

COVER PHOTOGRAPH BY LUCIEN FLOTTE; MOUNTAINSCAPE BY RICHARD BURDA/TAURUS PHOTOS

IN FOCUS

UP, UP, AND AWAY

While the BUNCH stagnates, IBM has gained market share in virtually every mainframe product category, according to a DATAMATION/Cowen & Co. survey of user spending.

by John W. Verity

In case there was any doubt, users' spending patterns show that more of the world is IBM's these days than ever before. In virtually every product area of its mainframe business, IBM is gaining strength and market share. The company is gaining significantly against traditional systems rivals and plug-compatible suppliers, and is well ahead of the pack rushing to market with office systems, personal computers, and other forms of distributed processors. If IBM can ship the new 3090 Sierra machines in volume and on schedule (see box), it stands to record strong shipments this year and even stronger ones the next: among 370 users, demand for MIPS is as high as ever, growing about 30% a year.

Systems rivals Honeywell, Sperry, NCR, and Burroughs, meanwhile, face relatively dim futures, as the size of their mainframe user bases are merely staying level, if not losing ground to IBM, the compatible vendors, and minicomputer makers. Honeywell in particular seems vulnerable to defections, while Sperry apparently has the best 1985 shipments to look forward to. Users of non-IBM mainframes continue to criticize their suppliers chiefly for a relative lack of industry-specific applications software.

Meanwhile, as shown in several recent measures of industry activity, shipments of personal computers to corporate sites are leveling off this year. Where last year's survey showed pc shipments up 75% over the year before (in terms of units), this year's are expected to be up only 7% over last year. IBM's PC family nevertheless remains a strategic vehicle for moves into a number of emerging markets and in some cases is even winning over IBM's own host-based solutions. Among this survey's respondents, PCs will account for 28% of the money they spend with IBM for mainframe systems in the U.S. and Canada this year.

These are some of the major findings of the 1985 DATAMATION/Cowen & Co. Computer/Telecommunications Industry Survey. The survey tabulates data from 4,346 unduplicated responses, more than 2,900 of which are from IBM sites. Besides shedding light on IBM's impressive gains in the mainframe arena, this year's survey paid special attention to such topics as personal computer acquisitions, packaged software buying trends, local networking, and office automation.

IBM's massive investments in plant, capital equipment, and R&D in the past 10 years and its flexibility in making financial deals to "get the business" are paying off royally, judging by the survey's findings. With a particularly strong share of the large-scale mainframe market under its control, IBM is reaping the rewards of advanced (and often unmatched) technology—the double-density 3380 disk drive and 3480 tape unit, for instance—by gaining market share from plug-compatible suppliers of all stripes. IBM is also leveraging off that control of the central system to win increasing orders for office systems, personal computers, and other devices that will eventually be tied into mainframes.

In the large 370 processor arena, the combined share (measured in dollars) held by Amdahl and National Advanced Systems shrank by 2 percentage points to 13% in this year's survey; the two firms split that share 11% and 2%, respectively. This is the third consecutive year that the survey has indicated such a drop.

In the 370-compatible disk arena, which is enjoying quite strong shipments, survey respondents indicated that IBM would supply 78% of their disks in the 24 months following the survey's February 1985 date. That commanding figure is up from 75% last year and 71% in the 1982 survey. Trailing IBM are Storage Technology with 6%, Amdahl with 4%, and Memorex with 3%. Narrowing the focus down to 3380-class drives alone, IBM's share of the shipments will be 86%, compared to 81% last year. Amdahl, Memorex, StorageTek, and Control Data stand to gain only 2% each of the 3380 shipments planned for this year and next.

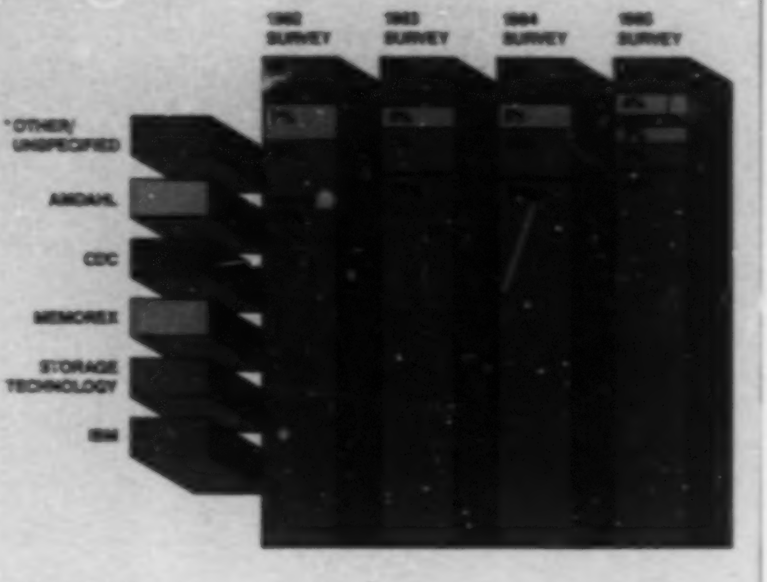
Plug-compatible manufacturers are not even holding their own in most product areas.

Similarly, IBM's hold on the 370 tape drive market is strengthening. Where last year it was to supply just under half (46%) of the tapes planned for installation in the following 24 months, this year users named IBM for two thirds (67%) of their planned tape acquisitions. StorageTek still ranks second in tape, with a 23% share this year, but has taken a dramatic fall from the 40% figure of last year. Memorex and Telex bring up

FIG. 1

IBM MAINFRAME DISK PLANS

Respondent plans for next 24 months disk add-on procurements (All models)

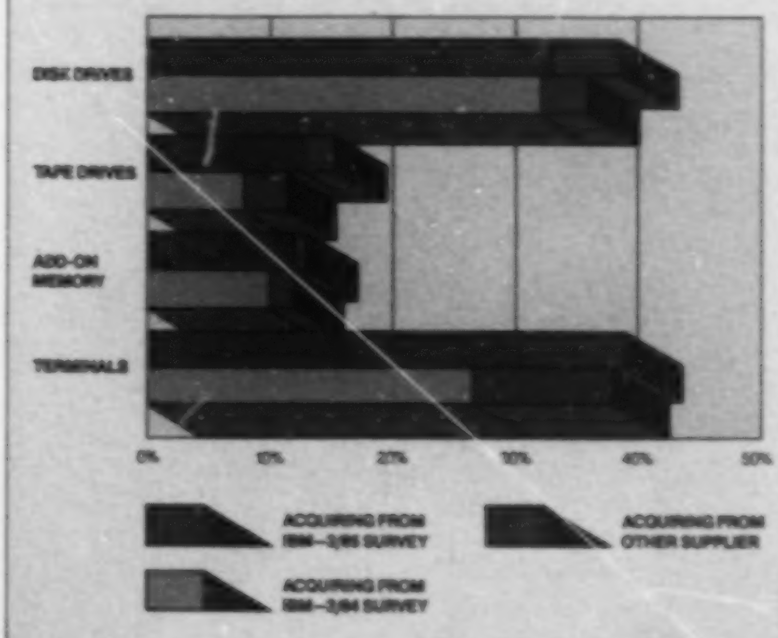


*NAS share 1% in 1985

FIG. 2

ADD-ON PERIPHERALS ACTIVITY

Percent of IBM sites planning to add peripherals/memory



the rear with 4% and 3%, respectively.

In the market for crt terminals attached to IBM mainframes (primarily 3270 gear), IBM's share reached 63% this year, up from 53% in 1983. In fact, the 3270-compatible manufacturing ranks have withered during the past year, with Raytheon (now defunct) and Four-Phase (absorbed into Motorola) dropping out of the survey findings altogether, and Telex, Lee Data, Memorex, and ITT-Courier gaining 11% (up from 8%), 3%, 2%, and 4% of planned crt business, respectively.

IBM's domination of the 370 add-on memory arena is even stronger. There it stands to win 91% (compared with 64% in 1981's survey and 82% last year) of users' planned business, followed by National Semiconductor and Intel with only 1% and 2%, respectively. This despite the fact that on average, IBM sites in the survey will attach 35 megabytes of main memory to the large-scale IBM processors they acquire over the next two years.

Within the 370-compatible processor market, National Advanced Systems gained some market share (22% this year, up from 17% last year) from Amdahl (61% this year vs. 62% in 1984). Meanwhile, IPL's share remained at 3%.

The battle for market share among pcms is evidently a heated one, as the companies compete among themselves as well as with IBM. Compatible processor makers, for instance, were found to be discounting their equipment more than last year, on average between 16% and 17%. Although the survey shows those vendors making no penetration into the high end of IBM's mainframe market compared with last year, a slight upturn was seen this year in the percentage of users saying they have such independent gear "under consideration." Overall, however, the shift in respondents' attitudes toward their current vendor was more favorable for IBM than for the pcms, and a strikingly high incidence of disaffection with suppliers was found among midrange compatible processor sites: of the sites planning to switch vendors, 60% of those using IPL gear, 59% of those using Magnuson, and 100% of the Cambex users indicated they would return to IBM.

Front-end communications controllers are increasingly important as remote terminals, pcs, and entire networks are attached to IBM mainframes. Respondents are expanding their use of such devices at a 5% compound annual rate, and here, too, IBM enjoys a commanding lead: 82% of the devices planned for installation by respondents this year and next will be from the industry leader, followed by 8% from NCR-Comten, 3% from Amdahl, and 1% from Memorex.

Except for scientific and engineering applications, IBM was the leading choice for small systems used in standalone and distributed processing situations, exceeding Digital Equipment Corp., Hewlett-Packard, and Wang combined. The System/36 is doing extremely well, accounting for a doubling over last year in the value of combined System/36 and 38 shipments.

Just as important, the industry leader has seen no weakening of its hold on the corporate personal computer marketplace. IBM is the main pc supplier at 80% of the responding sites and stands to ship 72% of the pc units they install in 1985. The PC family and compatibles are cited by 75% of those sites that have standardized on one or two pc brands. Much of IBM's pc strength in this survey is believed to be a reflection of the mainframe orientation of the survey population, whose members tend to buy pcs centrally and directly from the manufacturer and therefore favor IBM.

IBM PCs are being attached to those mainframes in greater numbers than ever, according to the survey. Among large mainframe sites, for instance, some 93% of respondents will have attached personal computers to their host systems by the end of next year. Interestingly, the trend is away from simple terminal emulation and toward direct, two-way interaction with the mainframe and through departmental minicomputers. These connections, of course, generally stimulate demand for more mainframe capacity, as seen in survey data showing that more than two fifths of the IBM sites doing so find their mainframes' workloads increase. About half the sites saw no change. The bigger the mainframe to which the PC is attached, the more likely it will load the mainframe.

In the IBM PC software arena, where Lotus Development's 1-2-3 has long been the market leader, IBM has gained sizable user bases for its Displaywrite, Personal Decision, and Topview products. The 1-2-3 product is evidently slowing and its replacement, Symphony, is taking up only part of the slack.

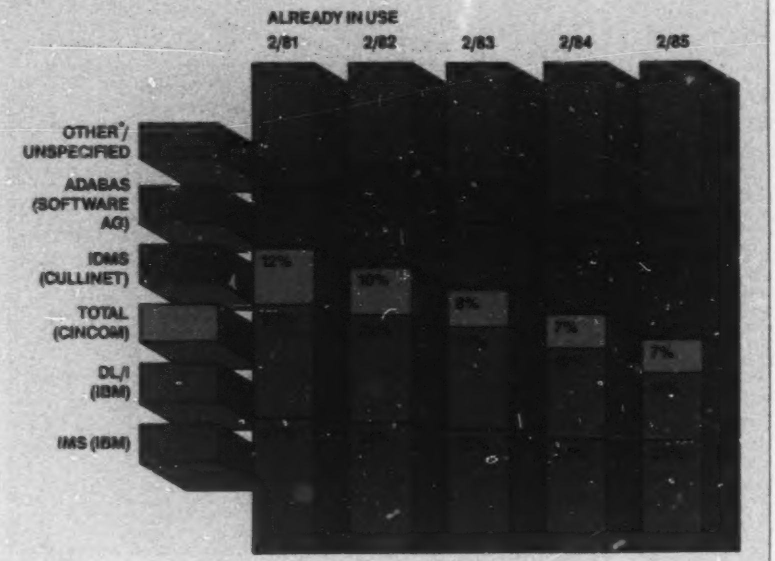
In the office systems market, IBM's majority share of the mainframe market is helping it win many orders. The company this year has a 61% share of the office systems/word processing installed by respondents (up from 53% last year), while Wang, in second place, saw its share fall to 15% from 19%.

Spending for host software packages continues to increase, but IBM's share of those outlays seems to have peaked in 1982 at 67% and is now at 62%. The reservoir of IBM users still not using database management packages is shrinking, especially among large-scale users. Of those database systems currently in use on 370 mainframes, IBM still has

FIG. 3

MAINFRAME DBMS PACKAGES

Query: If you are using a DBMS software package on your IBM mainframe system(s), which one(s)?



*Includes 11% other IBM (SQL, DB2, CPF, etc.), 5% ADR Datacom, 2% Focus, 2% System 2000, etc.

FIG. 4

IBM MOST POPULAR ALTERNATIVE

Query: If seriously considering a change in vendors, who is the likely supplier?

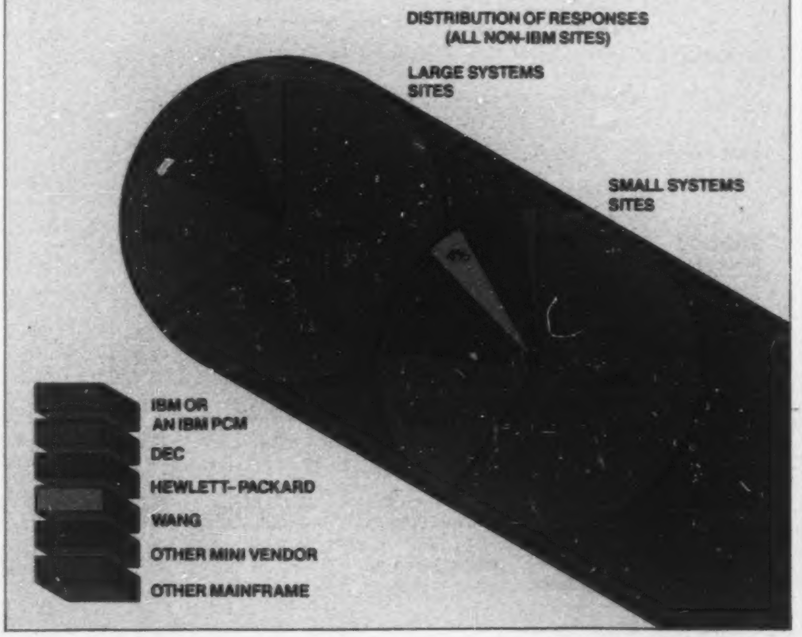


FIG. 5

PCS IN OFFICE SYSTEMS

Query: If your organization has office system(s) already in use (or planned), what is (or will be) the principal hardware orientation?

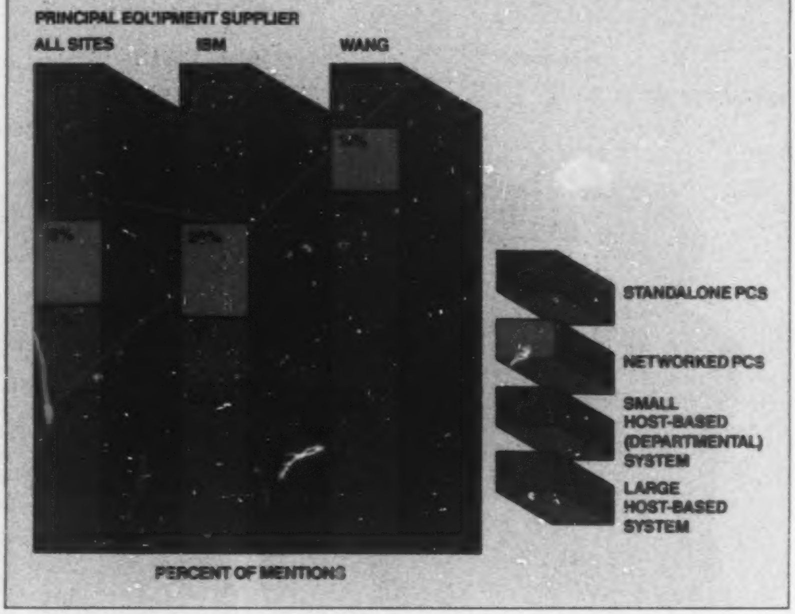
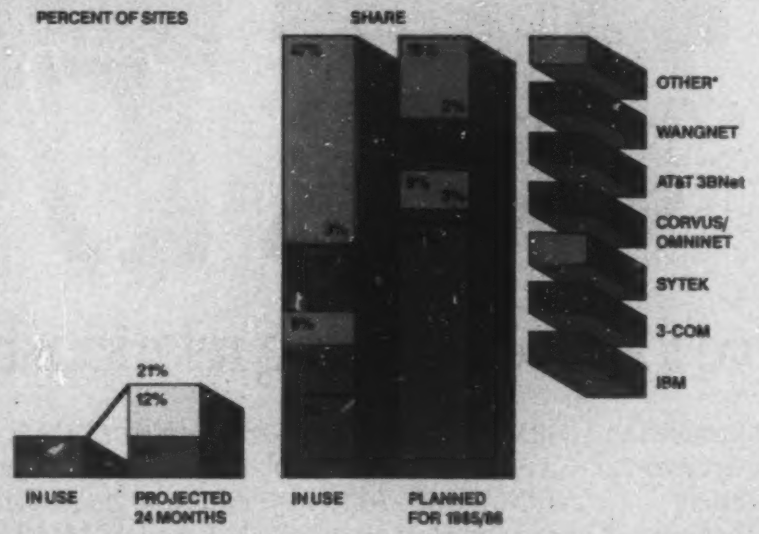


FIG. 6

LOCAL NETWORK PLANS

Query: If your organization has installed or plans to install a local area network (LAN), who is the supplier?



*Includes Xerox (4% in use, 1% planned), Ungermann-Bass (3%, 3%), Network Systems Hyperchannel (3%, 2%), Datapoint Arcnet (3%, 0%)

a leading share (23%) but one that has gradually decreased in the past four years as Cullinet, Applied Data Research, and Software AG expanded their shares. IBM has responded with several new database products, however, including DB2 and SQL, which appear to be helping it in this crucial systems software arena.

One area where IBM is the only supplier is mainframe operating systems. Here, just over half the respondents (up from 42% last year) said they will have the VM "hypervisor" system installed by the end of next year. Similarly, the Extended Architecture version of MVS, known as MVS/XA, is currently in use by 22% of all MVS users now (up from only 7% in last year's survey), but will be installed by 34% more this year or next. Another 22% indicated they indeed planned to install MVS/XA, but later.

The majority of users seem to be waiting for IBM to make its local area networking move before they install LANs. Only 9% of the respondents had LANs installed at the time of the survey, but another 12% said they planned to do so by the end of 1986. Almost three fifths of the sites still planning such networks claim they will use an IBM scheme. The bad news for Xerox Corp. is that its version of Ethernet, upon which much of the company's high hopes for office systems sales rested, is in use by 4% of the respondents now but fits into only 1% of the plans being implemented during the following 24 months.

LANs, however, appear to be gaining a strong lead over private branch exchanges (PBXs) as local data communications devices, at least among those sites that have made a choice. Meanwhile, AT&T's share of the PBX installations among respondents has increased for the first time in three years, hitting 39% of planned installations, up from only 31% of those already installed.

In the area of dp budgets, users expected an annual increase of 9.3% over the next three to five years. The most rapid hardware budget growth is among large-system sites where budgets will grow 10.5% a year. While demand for MIPS will grow at 33% a year, demand for disk megabytes will grow about 35% a year during the next three to five years. Asked what they expected the annual rate of decline in price-per-MIPS on IBM processors to be, respondents came up with an average of 14.5%.

The collective future of the BUNCH companies is far less bright than that of IBM, for their mainframe bases have ceased growing, and in several cases efforts to build on those bases with an array of small systems have not met with tremendous success. Generally, their loss is IBM's gain: the survey figures show a majority of defecting users move directly to IBM hardware. Some of the BUNCH companies have had to shore up their product lines with equipment purchased from oems, leading some users to speculate about their vendors' commitment to the computer business.

Burroughs. Efforts by Burroughs Corp. over the past few years to stem migration from its user base have evidently paid off in certain key areas, but users continue to have complaints about others. New computers, including the desktop machines Burroughs gets from Convergent Technologies, seem to have done their job in providing users with the new functions and price/performance they previously sought. Burroughs is in the midst of broadening its product line, adding the A Series medium- and large-scale mainframes, a series of Unix-based machines, and various office systems. It has also been concentrating on certain industrial sectors, apparently with good effect.

The A Series saw its first model, the A-3, unveiled last June and the survey shows a good response by users. More than a fifth (22%) of the users now running B6800/6900 equipment have plans to install A-3s this year, followed by 11% next year and 9% later.

Among B7800/7900 users, the corresponding figures are 10% this year, 6% next, and 7% later. The machine has been less warmly received by B1000 users; only about a fifth of them find the A-3 an appropriate upgrade. Among those not planning to acquire an A-3, however, the strongest reasons were that present systems are adequate and, particularly among B68/6900 sites, that they were dissatisfied with Burroughs as a supplier.

Judging by the need voiced by users for additional processing power, additional models in the A Series, one of which (the large-scale A-15) was introduced just after this survey was taken, will be welcomed. Among users at B1000 and B27-3900 sites, more than a fifth indicated a need to install larger processors while fully a fifth of large, B7000 sites need additional processors. Banking users showed a notably positive swing toward needing additional capacity. Burroughs sites claimed to be aware of machines labeled with odd numbers A1 through A17 that were expected to be introduced this year. Meanwhile, a substantial number of users also expect Burroughs this year to come out with its V Series of medium-scale machines.

The winding down of the B7900/4900 product cycle, noted again this year, has nevertheless apparently dampened respondents' mainframe spending with Burroughs when measured in dollar terms. Asked how much, as a percentage of their installed base, they expected to

FIG. 7

PC SOFTWARE PACKAGES

Query: Which of the following pc software is in use now or planned for use by your organization in 1985/86?

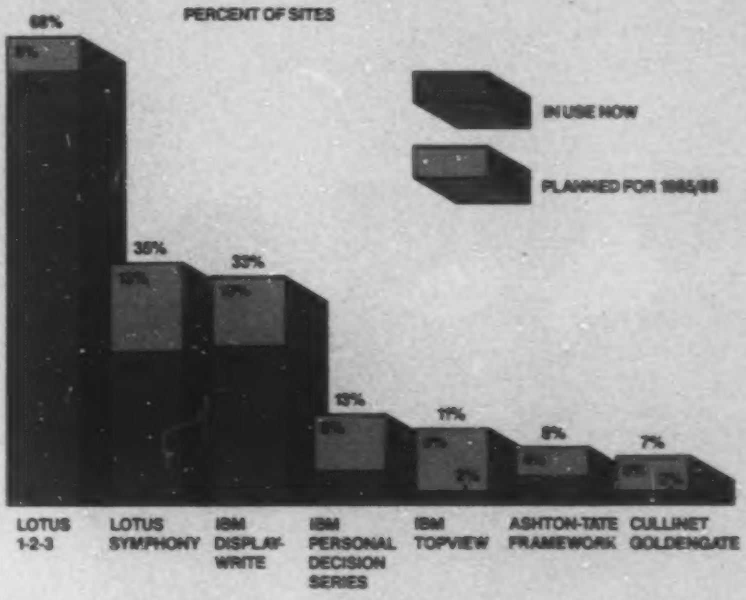
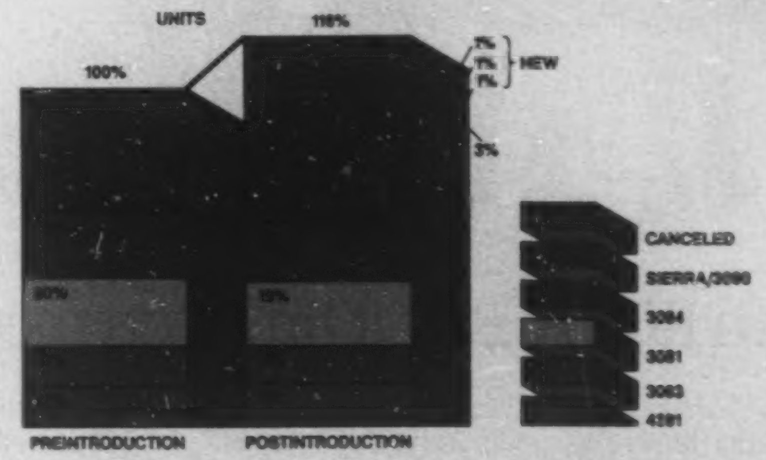


FIG. 8

RESPONSE TO SIERRA

Query: What, if any, changes have you made in your originally stated next 24 months' planned installations of IBM large systems pursuant to the introduction of the 3090/200 and 3090/400?



- Respondents had been asked in original survey questionnaire to "assume introduction by IBM of Sierra (new top-of-the-line system) in the January–June time frame for initial delivery prior to 1985 year-end" in detailing their next 24 months' systems installations plans.

spend in the following 24 months, users indicated only 15%, compared with the 31% and 41% seen in last year's survey and that of the year before. In terms of units to be acquired, this year's survey shows users planning to spend an equivalent of 23% of their installed base, compared with 19% and 20% in the two past surveys. These figures did not take into account A-15 orders or shipments of the Convergent-supplied B25.

Relative to the industry sector, users in national defense planned the most acquisition activity with Burroughs, while government and education were soft. There was a conspicuous lack of increased demand in the manufacturing customer base that is so important to Burroughs. Add-on peripherals and memory acquisitions will be weaker this year than last, even in the disk area where Burroughs' Memorex subsidiary is active.

In all markets but education there was a net positive shift in attitude toward Burroughs, on average 10%. Particularly more favorable attitudes were discovered among distribution and government sites, indicating that the company's "lines of business" focus is paying off. Medium-scale users, too, showed a strong shift in positive attitude.

Compared with IBM, Burroughs was claimed by users to excel in operating systems software (a traditional strong point for Burroughs), price/performance of systems, and database/data communications software. The weakest points for Burroughs were industry-specific software packages (cited by half the sites for the third year in a row) and systems engineering support and sales personnel. A shrinking percentage of users desired to replace their Burroughs mainframe altogether: 7% this year compared with 9% two surveys ago. Evidently, the A Series, new disk subsystems from Memorex, and other new offerings are helping to keep users loyal to Burroughs.

AT&T's share of private branch exchange installations has grown since last year.

Sperry. This vendor, like others in the BUNCH, showed some bright spots and some dark spots. Sperry sites are showing strong demand for additional mainframe capacity, now that the 1100/90 system is a proven product, and they are acquiring their vendor's Sperrylink office systems in increasing numbers. Users are evidently responding to the company's pricing strategy, which encourages purchasing over lease. On the other hand, the company's relatively new Unix systems are not finding broad acceptance among these respondents.

The 1100/90, finally shipped after many months' delay, has whetted Sperry users' appetite for additional computing capacity and promises to provide substantial activity in the coming two years. At large Sperry sites, only 26% of the respondents, down from 34% last year, said they would have enough capacity installed by year's end. On the other hand, 34% this year said they needed to add more memory, 20% needed a larger processor, and 12% will install additional processors. Even those with 1100/90s installed indicated a need to upgrade or install additional processors.

As 1100/90 shipments escalate, installation activity for Sperry's medium-scale products remains robust but seems to be slowing. Shipments of 1100/60 and 1100/70 systems peaked two or more years ago, according to this survey, and users of those systems are showing a growing interest in minicomputer solutions for future needs. Sperry is not particularly strong in the mini market, but it can look forward to a strong shipment year anyway. In dollar terms, respondents indicated plans to install gear worth 19% of their current installed base over the following 24 months. Last year's comparable figure was 13%.

Just over a fifth (22%) of all Sperry sites indicated they had Sperrylink equipment installed and another 14% have plans to install it. The strongest reception for the office system appears among 1100/60 and 70 sites, where 32% have Sperrylink installed and 19% have plans to install it. By contrast, however, 31% of all respondents said they had no plans to install Sperrylink and another 22% said they have considered the system but have no plans for it.

Sperry's push into the Unix arena has caught the interest of a fairly small segment of its user base, concentrated among scientific sites. Among midrange 1100 users, only 15% called Unix "very desirable," while a similar portion of large-scale users (16%) answered likewise. Like other vendors, Sperry may be finding that Unix on a mainframe is not an immediate seller.

In comparison with IBM, Sperry was relatively strongest in the areas of systems price/performance and operating system software, but continues to suffer in the vital applications software area where 67% of respondents, compared

SIERRA SAVES THE YEAR

A strong order response by users to IBM's February unveiling of the 3090 Sierra mainframes comes just when it needs their revenues to boost faltering 1985 growth.

The main all-vendor survey, taken before Sierra's formal introduction, indicates that a total of 92 Sierras were planned to be ordered by respondents, but a post-Sierra follow-up answered by 175 large IBM sites indicates a 40% step-up from these previously stated expectations. The original survey had asked respondents to assume that Sierra would be introduced before June 1985 and delivered by year-end.

In terms of units, the post-Sierra survey shows that the total number of IBM mainframes to be installed through the end of 1986 rose by 13% compared with the plans they previously indicated. Before Sierra, spending in dollars by all IBM respondents for all types of mainframe systems during the same period was anticipated to equal 25% of the if-sold value of their current installed base (compared with 28% last year), but once Sierra was public the figure rose to 30%. In other words, the 3090 seems to have been brought to market at a critical time when shipments of other large IBM systems (303X and 308X) were beginning to taper.

In fact, in terms of dollars to be spent, respondents indicated that 39% of their spending for IBM mainframes in the next 24 months would go for Sierra hardware, so evidently users are ordering Sierras at a strong rate. Among those users indicating a specific model number, about four 3090-200s were to be ordered for each model 400.

Once they had seen the machines' specs, most users (63%) said they would themselves purchase the Sierra hardware during the next 24 months, while 8% will lease through IBM Credit Corp. and 29% will lease through a third party.

The same users have taken well to the double-capacity 3380E disk drives that came out with Sierra. Of the DASD units they plan to install over the next two years, 41% will be single capacity followed by double-capacity drives, and 24% will be double right from the start.

Some users indicated they were mildly disappointed with the 3090's price/performance level and even more so with its delivery schedules, which according to IBM stretch out to early 1987.

Meanwhile, in comments collected during the follow-up survey, users said they expected IBM eventually to come out with a uniprocessor version of the 3090 (the model 200 has two processors and the 400 four). Some said the machine was too little too late, others claimed it would buoy the value of 308X systems on the used market, and still others were disappointed that 6Mbps channels were not offered. One user, in fact, said, "The 3090 offering is not a new generation of mainframe, just the final 370 offering. If this is *really* Sierra, it's a joke."

with 61% last year, found Sperry inferior to IBM.

NCR. The past year has seen NCR struggle to hang on to mainframe users, boost add-on activity among those users, and strengthen its showings in the small computer arena. It had only modest success in those endeavors, however.

First of all, the NCR sites have been slow to install the company's 9000 series machines, which the survey showed as accounting for only 16% of the installed base's dollar value, albeit up from 8% last year. The aging 8000 series (including the 9020 and 9040) systems, which made up 41% of the installed base value in the 1979 survey, still account for more than two fifths of this year's base. Clearly, large NCR users are in need of an upward migration path, and with most of the 8000 base sold off or fully depreciated, NCR can offer users significant price/performance increases in 9000 machines without giving up profits.

NCR's efforts to penetrate large accounts have evidently been a frustrating activity, judging by the fact that only 1% of the responding sites, down from the 4% measured last year, are at organizations with annual revenues over $500 million a year. More than half (52%) of NCR's sites bring in revenues of less than $25 million a year. About a quarter of those sites using small systems were found to be unsure of their future plans; another 16% said they planned to replace their NCR mainframes.

A small swing toward lower capacity needs in the future was registered this year, continuing a trend that was first seen in last year's figures. That trend, along with a general slowing of the economy, falling system prices, and a lack of high-end hardware presaged a slow growth year for NCR's systems business. In dollar terms, respondents' planned over the following two years to install equipment with a value equivalent to 12% of the current installed base. Last year's comparable figure was 24%.

NCR's Worksaver line, a three-year-old series of desktop machines supplied by Convergent Technologies, is making modest penetration of the NCR base, but it may be losing steam. Only 13% of respondents indicated they had Worksaver installed, followed by a mere 3% planning to install it. On the other hand, 22% of the respondents said they had considered the product but had no interest in it, and only 13% said they had any plans to evaluate it in the future.

Similarly, NCR is faring poorly in the personal computing arena where its MS/DOS machine is up against IBM. Even within its own mainframe customer base, only a third of those sites that have picked one or two standard makes have picked NCR pcs (40% chose IBM). The survey shows that large NCR users pick IBM more often, while smaller users favor NCR pcs.

Like other BUNCH companies, NCR must consider making Unix a standard offering on its mainframes. Once NCR, or any other company, discloses such plans, it becomes vulnerable to defections by users who, now forced to convert from one system to another, can more easily justify moving to another system vendor altogether. In this regard, NCR sites showed a marked drop from last year in their judgment of an incompatible operating system on the company's next generation of mainframes. Where last year 44% of the responding sites said such a new operating system would make them more likely to consider NCR for future system expansion, this year only 38% so indicated; compared with 4% last year, 8% this year said such a move would make them less likely to stay with NCR. A stronger positive reading on this issue came from large sites, where users are generally more inclined toward non-NCR solutions.

In comparison with IBM, NCR as a vendor was found most deficient in applications and database/data communications software. The Dayton, Ohio, company's field maintenance and systems price/performance were two particularly strong points with users, the survey indicates.

With product cycles peaking this year, Sperry appears poised to do the best of the BUNCH.

Honeywell. This Minneapolis manufacturer has seen far better days in its computer business, which has gloomier prospects than ever. The survey was completed before the company introduced its NEC-built DPS 90 systems, which should help Honeywell significantly with its largest customers, but the potential for defection among large Honeywell users remains strong, far higher than for Burroughs and Sperry. Moreover, the reservoir of Level 66 users to be migrated into the DPS 8 line is nearly tapped out now: of those left with small Level 66s, for instance, 27% plan to install DPS 8 hardware but 49% are not planning to do that.

On the other hand, an encouraging sign for future DPS 88 shipments is to be found in the fairly big number (65%) of large systems users willing to convert to the virtual memory GCOS 8 operating system. In fact, at the time the survey was taken, only two DPS 88 machines were installed by responding sites, but nine more are to be installed by year-end.

Planned acquisition activity (not including the sizable and dynamic DPS 6 base) for the following 24 months was down from a year earlier. In dollar terms, an equivalent of 11% of the value of the current installed base (down from 14% last year) will be installed this year. In terms of units, the figure is 13% of the installed base, equal to last year's figure.

Field upgrades still represent a significant source of high-margin business for Honeywell. This year and next such upgrades will in unit terms equal 15% of the installed mainframe base. Upgrade activity in the DPS 8 base is picking up now that many of those machines have been installed for two to three years: more than a quarter of those machines will be upgraded in the coming 24 months. Honeywell's share of add-on peripherals installations will generally be up this year, although it seems to be suffering from compatible competition in the terminal arena. And only a very small number of respondents (less than 10% in each size category) said they anticipate a major mainframe system introduction by Honeywell this year.

The small DPS 6 line continues to be an important adjunct to Honeywell's mainframe product strategy, with 53% of large systems sites and 43% of Level 64 sites indicating they are using or will use the machine to supplement their mainframes. As for office systems, Honeywell has shown a modest but growing penetration of its user base with its DPS 6-based system. Among large users, a fifth have installed or will install such gear (compared with only 13% last year), while for the second year running, 23% of those large users have considered the system but have no interest in using it.

Asked what change in their attitude toward Honeywell took place during the past year, users surveyed showed a shift to the negative. Level 62 users, in particular, were disgruntled about their systems being dead-ended. Among large systems users as a whole, 28% said their attitude was less favorable while 16% indicated an improvement. In a comparison with IBM, Honeywell ranked well in the systems price/performance and operating system software categories, but fared poorly in industry-specialized terminals and applications software. As a whole, Honeywell users were found to be less positive toward their supplier than customers of Sperry and Burroughs. (It should be noted that General Electric, Honeywell's largest user, declined to participate in the survey for reasons of corporate policy. The survey also concentrates solely on domestic sites, thus ignoring Honeywell-Bull's substantial user base in France.) ◉

To order the complete 1985-'86 DATAMATION/Cowen & Co. mainframe survey results for $750, please call Julianne Kilbride at (212) 605-9582.

dramatically in recent years. In 1981, according to Arthur D. Little, pcms held 5.6% of the U.S. general purpose large systems market, while by 1984 they had dropped to 4.5% of a $13.1 billion pie.

"It's clear from Amdahl's utterances about its Aspen operating system and its UTS Unix that it is looking for opportunities outside the MVS area. The writing is on the wall," ADL's Withington says.

Currently only 35% of Amdahl's customers (and 50% of IBM's) have embraced MVS/XA. A fair percentage will never even set off on what IBM calls "the journey," preferring instead to stay with IBM's older 24-bit architecture or to look for a more generic 32-bit architecture.

"But these are only peripheral opportunities for us," Amdahl's Gitomer stresses. "We don't believe these markets are big enough and so we must, and will, stay with MVS."

This, of course, means living with the object of the most potent fear, uncertainty, and doubt that IBM can generate—its XAA microcode. "We've been living with the myth of microcode since 1977, when MVS/E was announced with the 303X," Gitomer says. "We're used to battling the phantoms by now."

Perhaps the pcms' new rallying cry should be, "We ain't afraid of no ghosts!" ◉

TOO LITTLE, TOO LATE?

Can Honeywell save its user base with the DPS 90?

by Robert J. Crutchfield

Honeywell Information Systems' introduction of its DPS 90 line-topping mainframe—with deliveries commencing immediately—has come none too soon for a user community whose confidence and loyalty are waning faster than the Red Sox in September.

Executives at Honeywell stress the company's commitment to supporting and enlarging its user base. The Minneapolis conglomerate points to the DPS 90, the top end of which is comparable to IBM's 3090 Model 400 in power, as a "clear indication" that the company is in the computer business for the long run.

If only the users thought that way. A recent DATAMATION/Cowen and Co. study revealed that Honeywell—more than any other BUNCH company—is barely hanging on to its user base. Indeed, Honeywell users have the highest potential for defecting to other vendors: 31% of the 739 users surveyed indicated they are "seriously considering a change" to another vendor (see Fig. 1). Bob Hesser, Honeywell vice president of large computer marketing, declined to comment on the survey.

FIG. 1

MAINFRAME USERS CONSIDERING A CHANGE

VENDOR	1983	1984	1985
Honeywell	24%	30%	31%
Burroughs	19	16	19
Sperry	19	12	15
NCR	12	13	12

Source: Cowen & Co./Datamation Survey

Granted, there are some satisfied Honeywell users, such as General Electric Information Services Co. of Rockville, Md., and Dynamics Research, a defense contractor in Wilmington, Mass. But on the whole, signs of unrest abound. One consultant specializing in Honeywell dp shops says his clients are uncertain whether Honeywell can continue to ply the mainframe trade. "They could pack it in tomorrow or they could continue for quite a while," the consultant says. "It is their 100th anniversary [and] their chance to make it or break it."

At Dynamics Research, information services chief Richard Hendricson says he has "no concerns in the short term of three to five years. Like many users, we don't want to be committed to one vendor." Hendricson's dp shop has three tightly coupled DPS 8/70s and several VAXs, which are used for engineering and custom software development for Department of Defense applications.

Installations such as Dynamics Research helped HIS post its second consecutive healthy year in 1984, as revenues rose 10% to $1.8 billion and earnings jumped 37% to $180 million. The improved financial picture is due more to the cost-cutting measures, like laying off 3,500 workers in its Phoenix-based large systems division in the past three years, than to real growth, however.

One way that Honeywell has been able to save money has been by expanding its business relationships with NEC of Japan and Bull of France. Last year the three firms renewed for an additional decade their 20-year-old business relationship. For products sold by all three firms Honeywell has marketing rights to North America, Italy, and the U.K.; Bull has rights to the rest of Europe; and NEC has rights to the rest of the world.

Yet Honeywell's financial health hides several severe problems that the firm has yet to resolve. The most important is that the HIS user base is small—and shrinking. Company officials boast that Honeywell, NEC, and Bull have shipped over 3,000 DPS 8 or 88 mainframe cpus worldwide, yet only 500 sites in the U.S. have Honeywell mainframes.

The distinction between American and foreign users is important because the same machines run different operating systems in different countries. For years Honeywell's machines have been running GCOS-8, a proprietary system developed specifically for the DPS 8 line. Users have consistently praised the system's rich operating environment and its database offering, IDS 2.

The comparable NEC and Bull mainframes, however, primarily run the AOS system that was initially developed for Honeywell's DPS 6 line of minis. "If the Japanese were ever able to develop a decent operating system, we'd be in trouble," one user quips.

As good as GCOS is compared to other environments, however, it is still a proprietary operating system and users do report having trouble purchasing third-party software. One user notes, "For years Honeywell looked at third-party software vendors as competition. It only embraced third-party vendors a few years ago and it might be too late." Only recently have large third-party software vendors, like Atlanta-based MSA, offered applications software for the holdout GCOS-8 users.

Honeywell's software troubles are compounded by its staunch reluctance to offer hooks into industry standard environments, despite Bull's recent endorsement of Unix. NCR, National Advanced Systems, and Honeywell are the only U.S. mainframers who still ignore Unix. Moreover, to enter IBM networks, users must first buy a DPS 6 as a front-end SNA processor.

Honeywell users are more likely to defect to another mainframer than Sperry, NCR, or Burroughs users.

Honeywell's proprietary technology is alienating customers, not just because it lacks third-party software, but also because it strains employee relations in dp shops. The DATAMATION/Cowen & Co. study found that over 40% of Honeywell shops had trouble finding trained workers. Conversely, Honeywell users are having a hard time finding jobs. Hoffmann-La Roche, a pharmaceutical company in Nutley, N.J., recently laid off 80 programmers and analysts, many of whom have abandoned their Honeywell expertise in favor of crash courses in IBM technology.

With these obstacles to overcome, Honeywell clearly needs to succeed with the DPS 90. The firm's ability to ship the family of five systems now—18 months ahead of IBM's largest 3090 models—is certainly an asset. Gary Mueller, vice president of information processing at GEISCO, says he expects one DPS 90 to replace four or five DPS 8/70s. By the end of the year, GEISCO will take delivery of 12 DPS 90s for use in its remote computer services operation.

Honeywell's financial health hides several severe problems the firm has yet to resolve.

Hesser bills the five DPS 90 models—one-, two-, three-, and four-processor versions and a fault tolerant system—as "competitive" with IBM's Sierra family in commercial applications and "superior" in interactive environments. The company has fine-tuned the price of the DPS 90 series slightly downward from the original $3.9 million to $8.3 million range. The DPS 90 has integrated array processing capabilities that enable it to operate at 7.1MFLOPS in scientific environments.

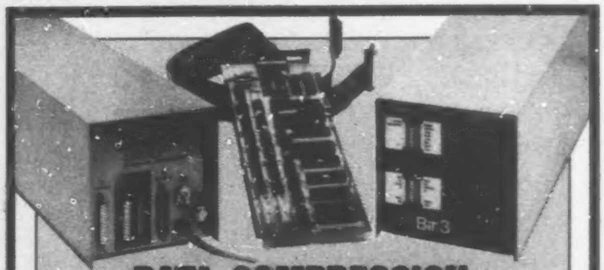
"The DPS 90 is suited for number crunching," one user observes. "The [commercial] throughput of the 90 is not as impressive as the 88." Honeywell claims the uniprocessor DPS 90 is 30% more powerful in commercial environments than the DPS 88 uniprocessor it supersedes, and 70% more powerful in scientific environments.

Hendricson of Dynamic Research adds that "the DPS 90 would be an attractive option if we were hurting for more processing cycles."

NEC is building the DPS 90 for all three companies. Known in Japan as the S1000, the system is based on Honeywell's design for its never-produced DPS 66/85. "The Japanese took the 66/85 and made it run faster," one user says. "The DPS 90 is a damn fast machine that is available today." (Hesser of Honeywell notes that the DPS 90 is five times more powerful than the 66/85 would have been.)

GEISCO'S MUELLER: A single DPS 90 can replace four or five older mainframes.

While some observers criticize Honeywell for oeming the DPS 90 from NEC, others defend the firm. "I don't see Honeywell's involvement with the Japa-



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nese as an indication they are going out of the mainframe business," one user argues. "When IBM separately sources from third parties people say it's a brilliant marketing move. It is a question of perception."

Customer perception of a company is often influenced by the firm's marketing savvy, and both users and Honeywell note the mainframer's difficulties in that area. One MIS vice president says, "You can see the slide rule hanging out of a Honeywell salesman's pocket. Honeywell doesn't know how to sell to the boardroom, just to techies."

Hesser admits there is a problem in sales. "We are too straightforward as marketeers and should be calling higher [in the customer's company]."

Part of Honeywell's strategy is to sell system solutions in addition to its general purpose computing business. HI sells office systems, a "smart building" system, and other products for vertical markets, but many of these have been unsuccessful. The office systems division, Billerica, Mass., recently laid off hundreds of workers and ordered four week-long plant shutdowns to save money.

Over 3,000 DPS 8 or 88 cpus are installed worldwide, but only 500 U.S. sites have them.

The company's great white hope, as it were, is its long-established presence in the process control industry, with thousands of installations to date. Honeywell officials hope to expand that charter into all factories, and they have recently added compatibility with General Motors' MAP standard to the product lineup. "We're not the only company staking a claim in manufacturing automation," concedes Bill George, executive vice president. "But we're different from all our competitors because we're the only one present in every segment of the business. "We've got an advantage with MAP, too. Our architecture includes MAP-baseband at the supervisory level and MAP-broadband at the plantwide level. We're positioned to respond rapidly to the MAP standard as it becomes firm."

Whether the factory automation effort or even the DPS 90 will enable Honeywell to enlarge its user base is unknown. While many critics say Honeywell's mainframe business is as good as dead and that its users are gradually abandoning the firm, the company's relationship with NEC and its remaining loyal customers promise to keep HIS afloat at least for a few years. And that's better than nothing at all. ●

DBMS

DATABASE MACHINES TAKE OFF

Users give rave reviews to the new database machines.

by Edith Myers

Computing's first lady, Commodore Grace Murray Hopper, has been talking up specialized database machines for some five years now.

"Computers are not made to search databases," she is fond of saying in speaking engagements all over the country. Hopper's blessing for back-end machines notwithstanding, database machines have not exactly made a big splash in the first half of the '80s, but maybe their time has come.

The leading providers certainly hope so. They are seven-year-old Britton-Lee, Los Gatos, Calif., and much younger Teradata Corp., Los Angeles. For the moment, Britton-Lee is primarily ad-

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THE DATAMATION 100

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FEATURES

22
IN FOCUS
IBM is plotting to solidify and increase its control of customers' computing and communications infrastructures and to gain control over the structure of worldwide networks, writes Angeline Pantages as she looks "Beyond Today's Blue."

36
A GLOBAL INDUSTRY . . . THE DATAMATION 100
John W. Verity

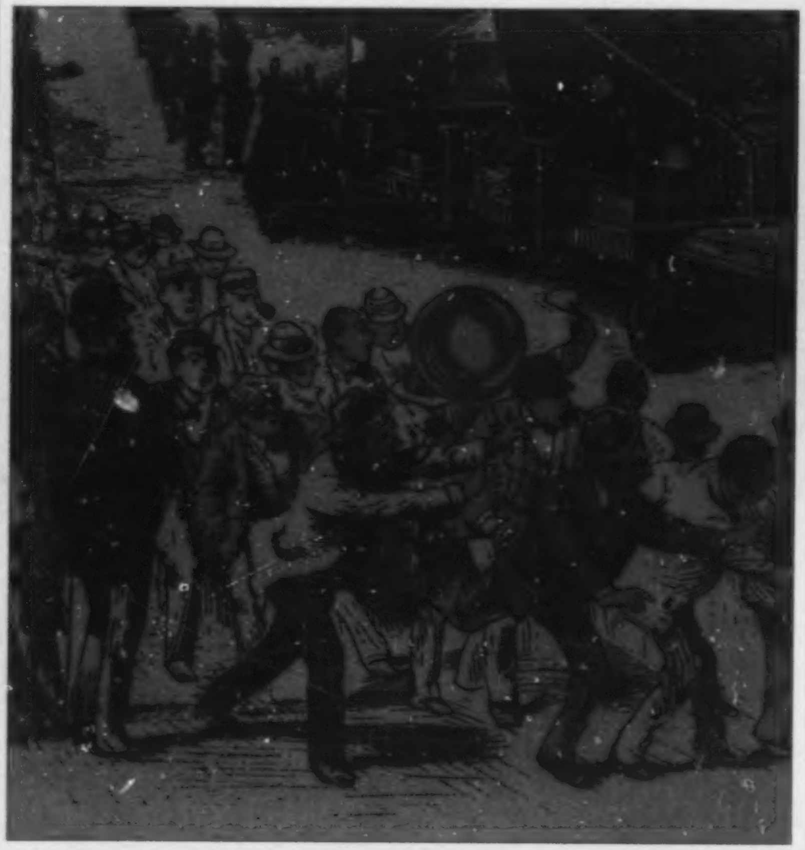
The year 1984 was a year of mergers and partnerships, of oppressively strong American dollars and unsteady economies, of soaring microprocessors and peaking microcomputers, of a newly divested AT&T entering the vendor market. It was a year the Top 100 worldwide dp companies pulled in $132 billion.

50
RANKING OF THE TOP 100
For the first time, our annual listing is a comprehensive ranking of dp companies throughout the world.

58
COMPANY PROFILES
The memorable mergers, stunning successes, phenomenal failures, and impressive profits of the Top 100.

186
ALLIANCES, NETWORKS, AND INTERNATIONAL COMPETITION
Michael Borrus and John Zysman

In the worldwide information industry, nationalism can be as significant a force as any technology, say two experts.



DEPARTMENTS

9 **LOOK AHEAD**
15 **LETTERS**
19 **EDITORIAL**
184 **MARKETPLACE**
196 **ADVERTISERS' INDEX**

INTERNATIONAL 32-1

-5 **MAKING MARRIAGES WORK**
-15 **JAPAN'S CHINA CONNECTION**
-23 **THE EUROPEAN EFFORT**

COVER PHOTOGRAPH BY WALTER WICK/
MODEL BY MARK YURKIW

A GLOBAL INDUSTRY...

THE DATAMATION 100

PHOTOGRAPH BY WALTER WICK/MODEL BY MARK YURKIW

For the first time anywhere . . . a comprehensive ranking of data processing companies worldwide.

by Pamela Archbold and John Verity

The year 1984 turned out to be a rather mixed bag for the global data processing industry. At first it enjoyed the U.S. economy's mild upturn, but it ended up staring into a dim-looking 1985. Data processing revenues in 1984 for the DATAMATION 100 companies, which include the revenues of non-U.S. companies for the first time, totaled $132 billion.

This year, the DATAMATION 100 comprises—for the first time anywhere—a comprehensive ranking of data processing companies located throughout the world. It combines previously separate U.S. and non-U.S. (European and Japanese) listings and marks a new beginning for the DATAMATION 100. Because 28 non-U.S.-based companies have entered the DATAMATION 100 ranks, just as many U.S. companies were eliminated. We have included a separate chart of the top 100 U.S. dp companies. (Only four U.S. companies made the list for the first time this year: Lotus Development Corp. at number 100, General DataComm Industries at number 97, Apollo Computer at number 80, and Zenith Electronics at number 75.)

While the number one company, IBM, showed total data processing revenues of $44.2 billion, the number 100 company, Lotus Development Corp., came in at $157 million. (In last year's listing, dp revenues ranged from IBM's $35.6 billion to Mead Corp.'s $94.5 million.) Almost 30% of the DATAMATION 100 showed data processing revenues of more than a billion dollars.

Not surprisingly, the fastest growth last year came primarily to microcomputer and small computer vendors, some of which virtually tripled their revenues (see Fig. 5). Of the 10 highest revenue growth companies—which include Lotus Development, Compaq, Apollo, Martin Marietta Corp., Telex Corp., and Apple Computer Corp.—six were heavily involved in micro-related markets. By year's end, however, good news for micro makers had begun to be more rare. Growth in the microcomputer market suddenly reached a plateau late in 1984 and the year witnessed the beginnings of a shakeout that continues today. Not only did the home computer market continue to fade, as seen in IBM's troubles with PCjr and Coleco's sluggish sales of Adam, but the all-important corporate pc market began to show signs of leveling after several years of staggering growth. Apple, number 14 this year with dp revenues of $1.89 billion, introduced its Macintosh computer in early 1984, saw the machine gain rapid acceptance at colleges and with individual buyers, but faced a great challenge in selling it to business customers.

Except for some robust firms whose products continue to be popular, pc software vendors seemed to be hit hard and many folded their tents altogether or sold out to larger, more successful competitors. No doubt that trend will continue, particularly as IBM has now signaled its intentions to grab a major piece of the pc software market.

AT&T made its debut in the computer market. It introduced a personal computer made by Olivetti, unveiled a series of minicomputers built by the former Western Electric operation, and tried to rally as many competitors as it could around the flag of the Unix operating system. While the telephone company's efforts didn't rock the computer industry—hardly a tremor was felt—AT&T was spoken of as a player from which further news is sure to come.

BIG BLUE REAFFIRMS ITS LEAD

IBM, on the other hand, reaffirmed its strength in the market by expanding most product lines and preparing the marketplace for its early-1985 introduction of the Sierra mainframes and double-capacity 3380 disk drives. The company also introduced the PC AT, a personal computer that came into the market with a bang last summer but ended up running into severe delivery problems. After a slow start for the PCjr, price cuts and a new keyboard helped that home computer gain sales during the Christmas season, but subsequent sales were so slack the machine was taken off the market.

The divestiture of AT&T evidently created opportunities for data communications companies in 1984, which generally showed significantly increased revenues over the previous year. General DataComm Industries, for instance, entered the DATAMATION 100 for the first time at number 98 on the strength of 1984 revenues of $161.2 million, up 67%. Micom Systems Inc., at number 93 this year, saw revenues rise 50.7% to $171.4 million.

Another high-growth area is computer aided design and manufacturing, or CAD/CAM. The hands-down growth winner in this market was Intergraph, which at number 52 showed CAD/CAM revenues of $363.4 million, up 60% from the year before. It was followed by McDonnell Douglas and Control Data, each of which had CAD/CAM revenues of $102 million, both having grown more than 46%. The biggest

FIG. 1

THE TOP 10 IN MAINFRAMES

DTM 100 RANK	COMPANY	1984 REVS. ($ MIL.)	1983 REVS. ($ MIL.)	% CHANGE
1	IBM	13,131.0	11,443.6	14.7
7	Sperry Corp.	1,451.1	1,300.9	11.5
3	Burroughs Corp.	1,450.0	1,300.0	11.5
6	Fujitsu Ltd.	1,399.7	1,050.0	33.3*
5	NCR Corp.	1,345.0	1,000.0	34.5
9	NEC Corp.	913.8	776.7	17.7*
4	Control Data Corp.	813.0	775.0	4.9
10	Siemens AG	807.0	686.0	17.6*
12	Hitachi Ltd.	771.8	679.2	13.6*
15	Honeywell Inc.	665.0	630.0	5.5

*In actual accounting currencies, Fujitsu mainframe revenues were up 25% to Y249.38 billion; NEC mainframe revenues were up 15% to Y184.51 billion; Hitachi mainframe revenues were up 13.6% to Y 161.31 billion; Siemens mainframe revenues were up 17.9% to DM2.30 billion.

FIG. 2

THE TOP 10 IN MINICOMPUTERS

DTM 100 RANK	COMPANY	1984 REVS. ($ MIL.)	1983 REVS. ($ MIL.)	% CHANGE
1	IBM	3,000.0	2,627.0	14.1
2	Digital Equipment Corp.	1,527.0	1,000.0	52.7
11	Wang Laboratories Inc.	970.0	892.9	8.6
8	Hewlett-Packard Co.	950.0	735.3	29.1
19	Data General Corp.	840.0	706.0	18.9
3	Burroughs Corp.	700.0	650.0	7.6
13	Ing. C. Olivetti & Co. S.P.A.	540.1	490.5	10.1*
40	Prime Computer Inc.	479.1	416.5	15.0
45	Tandem Computers Inc.	477.1	387.4	23.1
22	Toshiba Corp.	421.0	378.9	11.1*

*In actual accounting currencies, Olivetti mini revenues were up 27.4% to £949 billion; Toshiba mini revenues were up 11% to Y100 billion.

FIG. 3

THE TOP 10 IN MICROCOMPUTERS

DTM 100 RANK	COMPANY	1984 REVS. ($ MIL.)	1983 REVS. ($ MIL.)	% CHANGE
1	IBM	4,000.0	2,600.0	53.8
14	Apple Computer Inc.	1,897.9	1,084.7	74.9
23	Commodore International Ltd.	1,129.5	926.7	21.8
8	Hewlett-Packard Co.	510.0	399.4	27.7
7	Sperry Corp.	503.4	386.4	30.2
38	Tandy Corp.	402.8	568.2	−29.1
57	Convergent Technologies Inc.	361.7	163.2	121.6
61	Compaq Computer Corp.	329.0	111.2	195.8
13	Ing. C. Olivetti & Co. S.P.A.	289.6	252.1	14.8*
9	NEC Corp.	258.9	199.9	30.0*

*In actual accounting currencies, Olivetti micro revenues were up 32.8% to £508.8 billion; NEC micro revenues were up 30% to Y6.15 billion.

FIG. 4

THE TOP 10 IN COMPUTER SERVICES

DTM 100 RANK	COMPANY	1984 REVS. ($ MIL.)	1983 REVS. ($ MIL.)	% CHANGE
28	Automatic Data Processing	958.3	816.4	17.3
4	Control Data Corp.	930.5	1,030.0	−9.6
35	General Motors Corp.	786.1	718.8	9.3
31	General Electric Co.	725.0	600.0	20.8
39	Computer Sciences Corp.	709.6	718.9	−1.2
28	McDonnell Douglas Corp.	608.0	524.6	15.8
58	Martin Marietta Corp.	361.5	154.0	134.7
71	Boeing Co.	260.0	250.0	4.0
82	Cap Gemini Sogeti	206.0	183.7	12.1*
1	IBM	200.0	175.0	14.3

*In actual accounting currency, Cap Gemini Sogeti services revenues were up 28.6% to FF1.4 billion.

FIG. 5

GROWTH SPURTS

The 10 largest increases in dp revenues

DTM 100 RANK	COMPANY	% CHANGE	1984 REVS. ($ MIL.)	1983 REVS. ($ MIL.)
100	Lotus Development Corp.	196.2	157.0	53.0
61	Compaq Computer Corp.	195.8	329.0	111.2
80	Apollo Computer	167.5	215.9	80.7
58	Martin Marietta Data Systems	134.7	361.5	154.0
57	Convergent Technologies	121.6	361.7	163.2
50	Telex Corp.	99.6	442.7	221.7
14	Apple Computer Inc.	74.9	1,897.9	1,084.7
98	General DataComm Industries	67.3	161.2	96.3
52	Intergraph Corp.	60.2	403.8	252.0
96	Norsk Data AS	53.7*	166.7	121.2

*Percent measured in local currency, up to Kr1,360 million from Kr885 million.

FIG. 6

STUNTED GROWTH

Companies with negative revenue growth

DTM 100 RANK	COMPANY	% CHANGE IN LOCAL CURRENCY	1984 DP REVS. ($ MIL.)	1983 DP REVS. ($ MIL.)
38	Tandy Corp.	−23.9	719.1	945.0
51	Racal Corp.	−10.9*	412.0	525.8
34	Storage Technology	−8.8	808.6	886.6
95	CPT Corp.	−7.3	168.4	181.7
56	Mohawk Data Sciences	−4.1	366.0	382.0
97	Televideo Systems Inc.	−3.3	163.0	168.7
39	Computer Sciences Corp.	−1.2	709.6	718.9

*Percent decline is calculated in actual accounting currency. Calculated in dollars, Racal revenue was down 21.6%.

company in the CAD/CAM niche, however, remains Computervision Corp., with CAD/CAM revenues of $461 million.

It is nevertheless the traditional mainframe companies that still dominate the industry and the DATAMATION 100: IBM, its plug-compatible rivals, and the BUNCH companies (Burroughs, Sperry, NCR, Control Data, and Honeywell) all rank within the top 15. In fact, among the top 15 companies, only Digital Equipment Corp. (number 2), Hewlett-Packard (number 8), Wang Laboratories (number 11), and Apple (number 14) are best known for small systems.

In the mainframe market, IBM strengthened its position at the expense of traditional systems rivals (see "Up, Up, and Away," May 15, p. 32) and the plug-compatible vendors. Many competitors were forced to seek protection in relatively sheltered niche markets.

FEWER COMPANIES SHOW RED Nineteen of the top 100 data processing firms showed declines in total 1984 earnings compared with the year before, and nine showed actual losses (see Figs. 6 and 7). This compares favorably with 1982 and 1983, when the industry was in the midst of a recession and far more companies showed red ink.

For consistency's sake, non-U.S. companies have been compared with U.S. firms after revenues and earnings were converted from local currencies to dollars. The conversions are based on exchange rates for the appropriate time periods supplied by the Organization for Economic Cooperation and Development. Because of the dollar's wide swing in value during the year, the currency translations often hide actual growth rates. Therefore, in order to show actual as well as dollar-based growth, each non-U.S. supplier's dp revenue results have been listed in its actual accounting currency as well as in dollars on the DATAMATION 100 chart. A separate chart, Fig. 9, lists these non-U.S. companies and shows their dp growth rates in local currencies.

The dollar's recent strength has helped depress U.S. companies' sales abroad while boosting those of non-U.S. suppliers. As the dollar grew even stronger in the early months of 1985, several U.S. companies, including IBM, reported flat earnings. Meanwhile, the U.S. economy's growth of 1984 began to falter, forcing many suppliers—Wang Labs, Apple, and Honeywell, among others—to shut down production lines and put workers on furlough. The outlook for the rest of 1985 seems questionable at best.

As for major news, 1984 may be re-

FIG. 8

HEARTY WORKERS

The top 10 in dp revenues per employee

DTM 100 RANK	COMPANY	REVS. PER EMPL ($ THOU)	1984 DP REVS. ($ MIL.)	1984 EMPLS
61	**Compaq Computer Corp.**	235.0	329.0	1,400
57	**Convergent Technologies**	212.8	361.7	1,700
97	**Televideo Systems, Inc.**	132.2	163.0	1,233
53	**Tandon Corp.**	113.9	398.5	3,500
1	**IBM**	112.2*	44,292.0	394,930
36	**Amdahl Corp.**	111.3	779.4	7,000
85	**Quotron Systems Inc.**	110.0	189.8	1,725
45	**Tandem Computers Inc.**	108.3	565.9	5,223
77	**Cray Research Inc.**	103.9	228.8	2,203
95	**CPT Corp.**	91.7	256.8	2,800

*Because IBM receives an estimated 3.8% of its total revenues from nondp business, its dp productivity is assumed to be slightly higher. The other companies on the chart derive 100% of their total revenues from dp.

FIG. 7

HONOR WITHOUT PROFITS

The dp companies in the DATAMATION 100 that lost money in 1984

DTM 100 RANK	COMPANY	1984 EARNINGS LOSS ($ MIL.)
34	**Storage Technology Corp.**	505.5
56	**Mohawk Data Sciences Corp.**	120.9
16	**Groupe Bull**	55.9*
81	**Dysan Corp.**	49.9
68	**Mitel Corp.**	24.4**
57	**Convergent Technologies Corp.**	13.8
91	**CISI**	11.5***
92	**Centronics Data Computer Corp.**	4.5
44	**Datapoint Corp.**	.9

*A F466.6 million loss
**A C$32.1 million loss
***A F100.5 million loss

membered for several events. A newly divested AT&T entered the merchant computer business. The IBM-compatible peripherals market crumbled further than ever. Dr. Gene Amdahl's ambitious, deep-pocketed Trilogy project failed to deliver a 370-compatible mainframe. And late in the year, the bloom began to fade from the once-booming personal computer market. It was also a year for big mergers and acquisitions: IBM captured Rolm, General Motors bought Electronic Data Systems, McDonnell Douglas pulled in Tymshare, and Telex acquired what was left of Raytheon Data Systems after it dropped out of the 3270 terminal market. Meanwhile, in the non-U.S. arena, AT&T pumped $260 million into Olivetti for a 25% equity holding, Standard Telephones and Cable acquired British mainframer ICL, Fujitsu gained a 51% interest in Amdahl Corp., and Thorn EMI paid $133 million for chip maker Inmos. Thorn EMI also boosted its software holdings by acquiring EPS Consultants.

SOME ARM LINKING OCCURS

When not acquiring each other, the world's data processing companies also spent a good deal of time linking arms to jointly develop and market computers. Many of those links crossed national borders, and some entire oceans. Amdahl Corp., for instance, began selling Fujitsu's supercomputers, ICL jointly developed a machine with the same Japanese company, Honeywell topped off its mainframe line with a NEC product, and Sperry reached into several other companies to bolster its small computer lines. AT&T took on the Olivetti pc, Harris slapped its label on MassComp workstations, and a handful of companies were seen selling Convergent Technologies' workstation and minicomputer products. N.V. Philips of the Netherlands teamed up with Control Data to work on optical mass storage devices, while Dataproducts joined with Grupo Latino Mexicano to build printers for the Mexican market.

Due to the diversified nature of computing and communications, the year also saw many reorganizations as companies strove to adapt to changing market structures. Siemens, Mannesmann Kienzle, Datapoint, McDonnell Douglas, Sperry, General DataComm, and Digital Equipment are just some of the companies that regrouped.

The biggest loss was shown by Storage Technology, the Louisville, Colo., maker of plug-compatible peripherals, which found 1984 to be its worst year ever. Forced to write off numerous activities and file for Chapter 11 protection after a series of management blunders and shifting market conditions, StorageTek showed a loss of $505.5 million for the year. The company is still struggling to regain stability. Also hurting in the IBM-compatible peripherals sector was Control Data, which pulled out of the 370-type disk market and moved to stem losses in the oem disk sector. Once a powerhouse in the peripherals industry, CDC struggled last year to maintain profitability (earnings declined by 80% from 1983).

Other companies showing outright losses for the year were Mohawk Data Sciences, losing $120.9 million; Groupe Bull, losing $55.9 million; Dysan, losing $49.9 million; Convergent Technologies, losing $13.8 million; and Datapoint, losing $900,000 (see Fig. 7).

The year was also one of substantial gains in revenues and earnings for certain companies. Lotus Development Corp., the Cambridge, Mass., supplier of microcomputer software, made it to the DATAMATION 100 for the first time this year with dp revenues skyrocketing by 196% to $157 million from $53 million in 1983. Another microcomputer player, Compaq Corp., had an equally steep increase, showing revenues of $329 million in its second year of business, up 195.8% from 1983's $111 million, winding up at number 61. Zenith Electronics Corp. entered the list at number 75 on the quietly growing strength of its personal computer business; its dp revenues were $249 million in 1984, up 46% from the year before.

It is the traditional mainframe companies that still dominate the industry and the DATAMATION 100.

FIG. 9

BEYOND THE DOLLAR

Change in dp revenues of non-U.S. companies in actual accounting currencies

DTM 100 RANK	COMPANY	% CHNG.	1984 DP REVS. (MIL.)	1983 DP REVS. (MIL.)	COUNTRY
96	Norsk Data AS	53.6	Kr1,360.0	885.0	NORW
10	Siemens AG	42.4	DM7,950.0	5,582.0	GERM
90	Scicon Int.	41.3	£130.0	92.0	U.K.
69	Ferranti PLC	36.1	£199.5	146.5	U.K.
22	Toshiba Corp.	31.7	Y270,000.0	205,000.0	JAPAN
65	Ricoh Co. Ltd.	30.0	Y68,900.0	53,000.0	JAPAN
12	Hitachi Ltd.	29.4	Y522,500.0	403,750.0	JAPAN
87	Nokia Electronics	28.8	MK1,086.0	843.0	FINL
82	Cap Gemini Sogeti	28.5	FF1,800.0	1,400.0	FRAN
13	Olivetti & Co.	28.0	L3,535,700.0	2,758,959.7	ITALY
59	Thorn-EMI PLC	25.2	£260.0	207.6	U.K.
6	Fujitsu Ltd.	25.0	Y831,250.0	665,000.0	JAPAN
24	L.M. Ericsson	24.6	SKr9,290.0	7,450.0	SWED
9	NEC Corp.	21.7	Y665,000.0	546,012.5	JAPAN
63	BASF	21.4	DM850.0	700.0	GERM
60	Mannesman Kienzle	21.3	DM977.6	805.8	GERM
21	Nixdorf Computer AG	20.6	DM3,270.0	2,710.0	GERM
16	Groupe Bull	16.8	FF13,596.0	11,639.0	FRAN
33	Mitsubishi Electric Corp.	16.7	Y194,078.4	166,250.0	JAPAN
91	CISI	16.0	FF1,500.0	1,293.0	FRAN
68	Mitel	15.6	C$366.6	317.1	CAN
42	Triumph Adler	15.0	DM1,800.0	1,565.0	GERM
64	Plessey Co.	14.8	£217.5	189.4	U.K.
27	Northern Telecom	13.8	C$1,381.6	1,214.5	CAN
25	N.V. Philips	12.1	F3,499.9	3,120.0	NETH
20	ICL Ltd.	8.3	£917.0	846.5	U.K.
30	Oki Electric Industry Co.	20.0	Y213,750.0	178,125.0	JAPAN
51	Racal PLC	−10.9	£309.0	347.0	U.K.

In terms of data processing revenues per employee, a rough measure of corporate efficiency, personal computer maker Compaq topped the list with $235,000 generated by each of its 1,400 people. Next were Convergent Technologies, Televideo Systems Inc., Tandon Corp., and IBM Corp., with a range of from $212,000 to $112,000 per head (see Fig. 8).

Not surprisingly, IBM headed the list of top mainframe revenue producers with a total take of $13.13 billion, up 14.7% from the previous year. It was followed by Sperry with $1.45 billion, Burroughs with $1.45 billion, and Fujitsu Ltd. with $1.39 billion.

In microcomputer-related revenues, IBM was also tops, checking in with an estimated total of $4 billion, up 53.8% from the previous survey's figure of $2.6 billion. Apple followed at $1.89 billion.

A total of 28 non-U.S. companies joined the list. As might be expected, the newly added players are based in Japan and

Bridalveil Fall, Yosemite National Park, California c. 1927. Photography by Ansel Adams. Courtesy of the Ansel Adams Publishing Rights Trust. All rights reserved.

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The year 1984 saw many reorganizations as companies strove to adapt to changing market structures.

METHODOLOGY

Thoughout the year, DATAMATION tracks over 200 companies on a worldwide basis. Our survey is meant to be used as a comparative analysis, and therefore all revenues and earnings figures have been adjusted to calendar year calculations. Because over half of the companies covered operate on a fiscal year that does not coincide with the calendar year, their revenues and earnings for purposes of this survey have been derived from quarterly reports. DATAMATION has listed total net income in all cases, not income from continuing operations. Numbers relating to research and development expenditures and total number of employees, however, are reported as of each company's fiscal year-end.

During 1984, a number of DATAMATION 100 companies restated their performance figures, whether to reflect changed acounting methods, mergers, spinoffs, or just plain errors in earlier reports. Each chart and table within the survey incorporates the restated numbers.

Also, note that a company's internal sales, or sales made to other divisions or units within the company, are excluded from the year's total data processing revenues, as they are considered captive and not commercial sales.

In cases where a company has not explicitly stated dp revenues, DATAMATION has estimated the figures based on industry trends and knowledge.

For purposes of the survey, dp-related revenue is defined as general purpose dp products and services generated by one or more of the following categories of equipment: mainframes, minicomputers, microcomputers, office systems, data communications, peripherals and terminals, software and services, and maintenance and repair. Explicitly excluded are data transmission or "basic" services revenues from specialized common carriers; standalone electronic and mag card typewriters and standalone electronic cash registers; instrumentation; semiconductors; printed circuit boards; automatic test equipment; and dp supplies, with the exception of magnetic media for disk and tape drives. All peripherals that attach to a system are included. For computer-based manufacturing systems, such as computer-controlled machine tools, only the computer and hardcopy output devices are included and not the tools themselves.

Since non-U.S. companies have been included in the survey for the first time, simple comparisons of this year's rankings with those of last year and earlier are not valid.

Europe. They entered the rankings at all levels but came in primarily at the high end, where the U.S.-based BUNCH companies are found.

The largest non-U.S. company in the DATAMATION 100 is Fujitsu Ltd., the Japanese maker of IBM-compatible mainframes and owner of a controlling interest in Amdahl Corp. At number six, Fujitsu had estimated dp revenues of $3.49 billion in 1984, up 24.9% from the previous year. The second largest non-U.S. company is another Japanese manufacturer, Nippon Electric Corp., which at number nine showed estimated dp revenues of $2.79 billion. The next is Siemens AG of West Germany, which at number 10 had estimated dp revenues of $2.78 billion in 1984.

Figured in terms of actual accounting currencies, the three non-U.S. companies showing the best growth were Norsk Data AS of Norway, number 96 (up 53.6% to Kr1.36 billion); Siemens of West Germany, number 10 (up 42.4% to DM7.95 billion); and Scicon International Ltd. (up 41.3% to £130 million). For numbers on the rest of non-U.S. company growth, see Fig. 9.

Software and services companies were to be found in only eight slots in this year's rankings, compared with 13 last year. The largest services company this year was once again Automatic Data Processing, at number 29, which recorded revenues of $958 million for the year. Next largest was Electronic Data Systems, which was purchased last year by General Motors, with revenues of $786 million and berth number 35. It was followed closely by Computer Sciences Corp., number 39, which saw revenues slip by 1.2% from 1983 and end up at $709 million. The two fastest growing services companies were Xerox Corp. and Continental Telephone Inc., which each saw revenues rise 38.4% over 1983 (see Fig. 4). The biggest loser in this category was Control Data, whose scientific and engineering-oriented services dropped 9.6% in revenues during the year. CDC's other businesses also suffered hard times last year.

Evidently, the remote computing services business is not the growth area it used to be and, despite much talk of the importance of software, "pure" software vendors have yet to achieve revenues comparable to those shown by hardware manufacturers. ◉

THE DATAMATION 100

THE LEADING WORLDWIDE DP COMPANIES

1984 RANK	1983 RANK	COMPANY	1984 TOTAL REVENUE	1984 DP REVENUE	1983 DP REVENUE	DP REV % CHG
1	1	International Business Machines	$45,937.0	$44,292.0	$36,503.0	21.3
2	2	Digital Equipment Corp.	6,230.0	6,230.0	4,826.9	29.0
3	3	Burroughs Corp.	4,875.6	4,500.0	4,000.0	12.5
4	4	Control Data Corp.	5,026.9	3,755.5	3,507.9	7.0
5	5	NCR Corp.	4,074.3	3,670.0	3,333.2	10.1
6		Fujitsu Ltd.	6,440.7	3,499.3	2,800.0	24.9
7	6	Sperry Corp.	5,370.0	3,473.9	3,071.8	13.0
8	7	Hewlett-Packard Co.	6,297.0	3,400.0	2,496.0	36.2
9		NEC Corp.	7,594.3	2,799.4	2,299.0	21.7
10		Siemens AG	16,076.8	2,789.5	2,189.0	27.4
11	8	Wang Laboratories Inc.	2,421.1	2,420.7	1,792.9	35.0
12		Hitachi Ltd.	21,048.2	2,199.5	1,700.0	29.3
13		Ing. C. Olivetti & Co. S.P.A.	2,891.9	2,012.4	1,816.3	10.7
14	11	Apple Computer Corp.	1,897.9	1,897.9	1,084.7	74.9
15	9	Honeywell Inc.	6,073.6	1,825.0	1,666.0	9.5
16		Groupe Bull	1,555.6	1,555.6	1,527.4	1.8
17	10	Xerox Corp.	8,791.6	1,518.0	1,156.0	31.3
18	20	AT&T Co.	33,200.0	1,340.0	1,080.0	24.0
19	16	Data General Corp.	1,229.7	1,229.7	872.2	40.9
20		ICL	1,222.7	1,222.7	1,282.6	−4.6
21		Nixdorf Computer AG	1,147.4	1,147.4	1,062.7	7.9
22		Toshiba Corp.	13,891.8	1,136.6	863.2	31.6
23	14	Commodore International Ltd.	1,189.5	1,129.5	926.7	21.8
24		L.M. Ericsson	3,545.1	1,123.3	971.3	15.6
25	12	TRW Inc.	6,061.7	1,105.0	1,015.0	8.8
26		N.V. Philips Gloeilampenfabrieken	5,221.2	1,090.3	1,094.7	−0.4
27	21	Northern Telecom Inc.	3,330.0	1,050.0	923.0	13.7
28	29	McDonnell Douglas Corp.	9,662.6	982.8	781.8	25.7
29	19	Automatic Data Processing Inc.	958.3	958.3	816.4	17.3
30		Oki Electric Industry Co. Ltd.	1,738.6	899.8	750.0	19.8
31	18	General Electric Co.	27,950.0	865.0	820.0	5.4
32	17	Texas Instruments Inc.	5,741.6	860.0	800.0	7.5
33		Mitsubishi Electric Corp.	7,329.5	817.0	700.0	16.7
34	15	Storage Technology Corp.	808.0	808.0	886.6	−8.8
35	24	General Motors Corp.	83,889.9	786.1	718.8	9.3
36	22	Amdahl Corp.	779.4	779.4	777.7	0.2
37	26	Harris Corp.	2,187.7	730.0	580.0	25.8
38	13	Tandy Corp.	2,794.7	719.1	945.0	−23.9
39	23	Computer Sciences Corp.	709.6	709.6	718.9	−1.2
40	31	Prime Computer Inc.	642.8	642.8	516.5	24.4
41	25	ITT Corp.	12,700.9	640.0	600.0	6.6
42		Triumph Adler AG	807.0	631.6	613.7	2.9
43	32	Motorola Inc.	5,534.0	618.0	514.0	20.2
44	28	Datapoint Corp.	589.2	589.2	554.4	6.2
45	33	Tandem Computers Inc.	565.9	565.9	450.5	25.6
46	35	Computervision Corp.	556.3	556.3	400.4	38.9
47	34	National Semiconductor	1,818.0	550.0	425.0	29.4
48	41	Dataproducts Corp.	484.5	484.5	343.5	41.0
49	39	C. Itoh Electronics Inc.*	531.1	443.1	360.3	22.9
50	53	Telex Corp.	523.8	442.7	221.7	99.6

Ranking is by dp revenue in millions. NA: Not available. *Constitutes U.S. operations only.

	NONDOLLAR ACCTG CURRENCY					R&D			
DP AS % OF TOT	1984 DP	1983 DP	% CHG		1984 EMPL	1984	% TOT	NET INCOME	FISCAL YEAR END
96.4					394,930	$4,200	9.1	$6,582.0	Dec.
100.0					88,600	630	10.1	487.0	June
92.3					65,000	274	5.6	244.9	Dec.
74.7					54,100	422	8.3	31.6	Dec.
90.0					62,000	286	7.0	342.6	Dec.
54.3	Y831,250.0	Y665,000.0	25.0	JAPAN	73,243	644	10.0	366.3	March
64.7					77,000	445	8.2	267.6	March
53.9					80,000	NA	NA	665.0	Dec.
36.8	Y665,000.0	Y546,012.5	21.8	JAPAN	78,369	387	5.1	187.6	March
17.3	DM7,950.0	DM5,582.0	42.4	W GER	319,000	1,333	8.2	374.0	Sept.
99.9					30,000	160	6.6	230.7	June
10.4	Y522,500.0	Y403,750.0	29.4	JAPAN	161,533	997	4.7	824.8	March
69.6	L3,535,700.0	L2,758,959.7	28.2	ITALY	47,800	202	7.0	168.1	Dec.
100.0					5,362	71	3.7	104.3	June
30.0					94,300	422	6.9	239.0	Dec.
100.0	FF13,596.0	FF11,639.0	16.8	FRANCE	26,435	161	10.3	−55.9	Dec.
17.2					103,457	561	6.3	290.5	Dec.
4.0					365,000	2,400	7.2	1,369.9	Dec.
100.0					17,695	101	8.2	78.4	Sept.
100.0	£917.0	£846.5	8.3	U.K.	15,167	NA	NA	40.3	Dec.
100.0	DM3,270.0	DM2,710.0	20.7	W GER	20,190	68	8.5	NA	Dec.
8.1	Y270,000.0	Y205,000.0	31.7	JAPAN	NA	628	4.5	374.7	March
94.9					NA	45	1.7	100.3	June
31.6	Skr9,290.0	Skr7,450.0	24.7	SWEDEN	70,000	NA	NA	NA	Dec.
18.2					93,524	146	2.4	266.8	Dec.
20.8	G3,499.0	G3,120.0	12.2	NETH	344,000	NA	NA	346.0	Dec.
31.5					47,000	328	9.8	241.0	Dec.
10.1					88,391	NA	NA	325.3	Dec.
100.0					17,500	NA	NA	79.4	June
51.7	Y213,750.0	Y178,125.0	20.0	JAPAN	17,800	77	4.4	42.1	March
3.0					NA	1,038	3.7	2,280.0	Dec.
14.9					86,563	691	12.0	316.0	Dec.
11.1	Y194,078.4	Y166,250.0	16.7	JAPAN	67,410	NA	NA	218.9	March
100.0					NA	NA	NA	−505.5	Dec.
.9					748,000	NA	NA	4,515.5	Dec.
100.0					7,000	125	16.0	36.4	Dec.
33.3					30,000	105	4.6	90.7	June
25.7					32,000	NA	NA	234.9	June
100.0					13,400	NA	NA	27.6	March
100.0					7,348	64	9.9	59.7	Dec.
5.0					252,000	974	7.6	448.0	Dec.
78.2	DM1,800.0	DM1,565.0	15.0	W GER	11,049	NA	NA	NA	Dec.
11.1					99,900	411	7.4	387.0	Dec.
100.0					8,431	46	7.9	−0.9	July
100.0					5,223	56	10.0	46.9	Sept.
100.0					6,500	60	10.9	41.4	Dec.
30.2					41,749	158	8.7	84.2	May
100.0					5,800	31	6.4	35.8	March
83.4					NA	NA	NA	NA	Dec.
84.5					5,862	21	4.1	47.6	March

THE DATAMATION 100

THE LEADING WORLDWIDE DP COMPANIES

1984 RANK	1983 RANK	COMPANY	1984 TOTAL REVENUE	1984 DP REVENUE	1983 DP REVENUE	DP REV % CHG
51		Racal Electronics PLC	$1,173.3	$412.0	$525.8	-21.6
52	47	Intergraph Corp.	403.8	403.8	252.0	60.2
53	40	Tandon Corp.	398.5	398.5	346.9	14.8
54	43	Tektronix Inc.	1,419.8	384.0	300.0	28.0
55	73	Diebold Inc.	474.1	374.1	346.0	8.1
56	38	Mohawk Data Sciences Corp.	382.0	366.0	382.0	-4.1
57	72	Convergent Technologies Inc.	361.7	361.7	163.2	121.6
58	78	Martin Marietta Corp.	3,920.4	361.5	154.0	134.7
59		Thorn EMI PLC	3,761.2	346.7	314.5	10.2
60		Mannesman Kienzle GMBH	428.1	343.0	316.0	8.5
61	91	Compaq Computer Corp.	329.0	329.0	111.2	195.8
62	64	Seagate Technology	304.0	304.0	222.0	36.9
63		BASF	NA	298.2	274.5	8.6
64		Plessey Co. PLC	1,953.1	290.0	287.0	1.0
65		Ricoh Company Ltd.	NA	290.0	223.2	29.9
66	57	Paradyne Corp.	289.9	289.9	209.0	38.7
67	46	3M	7,705.0	281.4	260.0	8.2
68	49	Mitel Corp.	277.4	277.4	241.0	15.1
69		Ferranti PLC	686.7	266.0	222.0	19.8
70	58	Sanders Associates Inc.	837.7	260.8	209.7	24.3
71	48	Boeing Co.	10,354.0	260.0	250.0	4.0
72	55	Shared Medical Systems Corp.	256.8	256.8	210.8	21.8
73	59	M/A-COM Inc.	797.3	250.0	200.0	25.0
74	51	Perkin-Elmer Corp.	1,255.5	250.0	225.0	11.1
75	101	Zenith Electronics Corp.	1,716.0	249.0	170.0	46.4
76	67	Continental Telecom Inc.	2,300.0	242.4	174.8	38.6
77	68	Cray Research Inc.	228.8	228.8	169.7	34.8
78	56	General Instrument Corp.	1,017.7	225.0	210.0	7.1
79	42	Gould Inc.	1,390.4	224.5	189.0	18.7
80	106	Apollo Computer Inc.	215.9	215.9	80.7	167.5
81	65	Dysan Corp.	214.1	214.1	180.0	18.9
82		Cap Gemini Sogeti	206.0	206.0	183.7	12.1
83	62	Informatics General Corp.	191.2	191.2	152.1	25.7
84	84	NBI Inc.	191.1	191.1	163.8	16.6
85	77	Quotron Systems Inc.	189.8	189.8	153.8	23.4
86	75	Gerber Scientific Inc.	189.7	189.7	137.3	38.1
87		Nokia Electronics	1,568.2	181.0	151.3	19.6
88	66	Intel Corp.	1,629.3	180.0	175.0	2.8
89	78	Uccel Corp.	173.4	173.4	153.0	13.3
90		Scicon International Ltd.	173.3	173.3	139.4	24.3
91		CISI	171.6	171.6	169.7	1.1
92	71	Centronics Data Computer Corp.	171.5	171.5	164.1	4.5
93	90	Micom Systems Inc.	171.4	171.4	113.7	50.7
94	80	Verbatim Corp.	168.9	168.9	147.4	14.5
95	63	CPT Corp.	168.4	168.4	181.7	-7.3
96		Norsk Data AS	166.7	166.7	121.2	37.5
97	69	Televideo Systems Inc.	163.0	163.0	168.7	-3.3
98	113	General DataComm Industries Inc.	161.2	161.2	96.3	67.3
99	85	Planning Research Corp.	324.3	161.2	135.6	18.8
100		Lotus Development	157.0	157.0	53.0	196.2

Ranking is by dp revenue in millions.   NA: Not available.

DP AS % OF TOT	NONDOLLAR ACCTG CURRENCY			1984	EMPL.	R&D		NET INCOME	FISCAL YEAR END
		%							
	1984 DP	1983 DP	CHG			1984	% TOT		
35.1	£309.0	£347.0	−11.0	U.K.	18,000	NA	NA	$164.0	March
100.0						$37	9.1	82.0	Dec.
100.0					3,900	16	4.0	4.7	Sept.
27.0					30,821	67	4.7	131.5	May
78.9					5,505	12	2.5	68.9	Dec.
95.8					5,100	28	7.3	−120.9	April
100.0					1,700	16	4.4	−13.8	Dec.
9.2					61,000	NA	NA	191.8	Dec.
9.2	£260.0	£207.6	25.2	U.K.	91,544	NA	NA	120.8	March
80.1	DM977.6	DM805.8	21.3	W GER	8,000	NA	NA	NA	Dec.
100.0					1,400	11	3.3	12.9	Dec.
100.0					NA	12	4.1	23.8	June
NA	DM850.0	DM700.0	21.4	W GER	NA	NA	NA	NA	Dec.
14.8	£217.5	£189.4	14.8	U.K.	38,838	NA	NA	127.9	Dec.
NA	Y68,900.0	Y53,000.0	30.0	JAPAN	20,000	NA	NA	67.8	March
100.0					NA	NA	NA	11.0	Dec.
3.6					86,700	443	5.7	733.0	Dec.
100.0					4,900	49	17.6	NA	Feb.
30.8	£199.5	£146.5	36.2	U.K.	11,087	NA	NA	38.4	Dec.
31.1					10,700	33	4.0	38.7	July
2.5					93,000	NA	NA	787.0	Dec.
100.0					2,800	22	8.0	33.8	Dec.
31.3					10,541	25	3.3	39.9	Sept.
19.9					15,480	92	7.3	66.0	July
14.5					29,000	86	5.0	63.6	Dec.
10.5					22,000	NA	NA	196.0	Dec.
100.0					2,203	37	16.3	45.4	Dec.
22.1					NA	48	4.7	32.7	Feb.
16.0					19,603	123	6.8	17.8	Dec.
100.0					3,021	25	11.8	23.9	Dec.
100.0					NA	30	14.3	−49.9	Oct.
100.0	FF1,800.0	FF1,400.0	28.6	FRANCE	4,600	10	5.0	10.9	Dec.
100.0					2,614	4	2.4	4.7	Dec.
100.0					1,987	10	5.2	14.6	Dec.
100.0					1,725	NA	NA	28.8	Dec.
100.0					NA	NA	NA	23.6	Dec.
11.5	M1,086.0	M843.0	28.8	FINLAND	28,000	38	2.3	14.2	Dec.
11.0					25,400	180	11.0	198.2	Dec.
100.0					NA	13	7.4	6.0	Dec.
100.0	£130.0	£92.0	41.3	U.K.	3,000	NA	NA	NA	Dec.
100.0	FF1,500.0	FF1,293.0	16.0	FRANCE	3,030	8	5.0	11.5	Dec.
100.0					NA	13	7.5	0.3	Dec.
100.0					1,908	16	8.1	25.4	March
100.0					2,780	16	9.5	−2.0	June
100.0					1,744	10	5.9	5.4	June
100.0	Kr1,360.0	Kr885.0	53.7	NORWAY	NA	NA	NA	NA	Dec.
100.0					1,233	9	5.5	4.5	Dec.
100.0					2,029	10	6.7	12.6	Sept.
49.7					5,600	NA	NA	7.2	June
100.0					NA	13	8.2	36.0	Dec.

THE DATAMATION 100

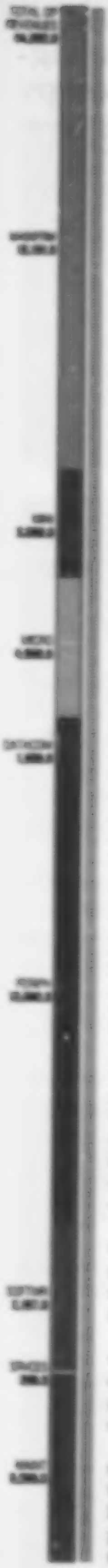
THE LEADING U.S. DP COMPANIES

1984 RANK	COMPANY	1984 DP REVENUE
1	International Business Machines	$44,292.0
2	Digital Equipment Corp.	6,230.0
3	Burroughs Corp.	4,500.0
4	Control Data Corp.	3,755.5
5	NCR Corp.	3,670.0
6	Sperry Corp.	3,473.8
7	Hewlett-Packard Co.	3,400.0
8	Wang Laboratories Inc.	2,420.7
9	Apple Computer Corp.	1,897.9
10	Honeywell Inc.	1,825.0
11	Xerox Corp.	1,316.0
12	Data General Corp.	1,229.7
13	Commodore International Ltd.	1,120.8
14	TRW Inc.	1,106.0
15	McDonnell Douglas Corp.	962.8
16	Automatic Data Processing Inc.	958.3
17	General Electric Co.	885.0
18	Texas Instruments Inc.	880.0
19	Storage Technology Corp.	858.6
20	General Motors Corp.	786.1
21	Amdahl Corp.	779.4
22	Harris Corp.	730.0
23	Tandy Corp.	719.1
24	Computer Sciences Corp.	709.8
25	Prime Computer Inc.	642.8
26	ITT Corp.	640.0
27	Motorola Inc.	610.0
28	Datapoint Corp.	600.2
29	Tandem Computers Inc.	565.9
30	Computervision Corp.	555.3
31	National Semiconductor Corp.	550.0
32	Dataproducts Corp.	484.5
33	Telex Corp.	442.7
34	Intergraph Corp.	403.8
35	Tandon Corp.	398.8
36	Tektronix Inc.	384.0
37	Diebold Inc.	374.1
38	Mohawk Data Sciences Corp.	368.0
39	Convergent Technologies Inc.	361.7
40	Martin Marietta Corp.	361.5
41	Compaq Computer Corp.	329.0
42	Seagate Technology	304.0
43	Paradyne Corp.	289.9
44	3M	281.4
45	Sanders Associates	260.8
46	Boeing Co.	260.0
47	Shared Medical Systems Corp.	255.8
48	M/A-Com Inc.	250.0
49	Perkin-Elmer Corp.	250.0
50	Zenith Electronics Corp.	249.0
51	Continental Telecom Inc.	$242.4
52	Cray Research Inc.	228.8
53	General Instrument Corp.	225.0
54	Gould Inc.	224.5
55	Apollo Computer Inc.	216.0
56	Dysan Corp.	214.1
57	Informatics General Corp.	191.2
58	NBI Inc.	191.1
59	Quotron Systems Inc.	189.8
60	Gerber Scientific Inc.	189.7
61	Intel Corp.	180.0
62	Ussel Corp.	173.4
63	Centronics Data Computer Corp.	171.8
64	Micom Systems Inc.	171.4
65	Verbatim Corp.	169.9
66	CPT Corp.	168.4
67	Televideo Systems Inc.	163.0
68	General DataComm Industries	161.2
69	Planning Research Corp.	161.2
70	Lotus Development Corp.	157.0
71	Cipher Data Products Inc.*	153.8
72	Signal Cos.*	150.0**
73	Reynolds & Reynolds Co.*	150.0**
74	Recognition Equipment Inc.*	148.2
75	Decision Data Computer Corp.*	147.0
76	Printronix, Inc.*	146.8
77	Cullinet Software*	143.0
78	Management Sciences America Inc.*	141.8
79	National Data Corp.*	139.9
80	Pidata Corp.*	135.8
81	InteCom Inc.	131.7
82	Lear Siegler Inc.*	130.0**
83	Applied Data Research Inc.	128.2
84	Mead Corp.*	127.8
85	Computer & Communications Tech. Corp.	122.1
86	Intelligent Systems Inc.	121.0**
87	Floating Point Systems, Inc.*	120.4
88	Schlumberger Ltd.*	120.0**
89	Kaypro Corp.	118.0
90	Computer Associates International Inc.	116.1
91	Software AG Systems Inc.	115.0
92	Telerate Inc.	114.0
93	Commerce Clearing House Inc.	113.8
94	ISC Systems Corp.	107.0
95	Lee Data Corp.	106.9
96	Dun & Bradstreet*	100.0
97	American Management Systems Inc.	97.0
98	Conrac Corp.	96.0
99	Cincom Systems	96.0
100	HBO & Co.	94.7

Ranking is by dp revenue in millions of dollars.

*Company appeared on 1983 Datamation Top 100 list and does not appear on 1984 list.

**Estimated by Datamation.



1

INTERNATIONAL BUSINESS MACHINES

Old Orchard Rd.
Armonk, NY 10504
(914) 765-1900

Yes, IBM can fail, as it finally proved with its PCjr. Yet that blot hardly obscures the firm's successes throughout last year. Revenues and profits continued their upward spiral, overcoming the drag of currency translations that affected 40% of its business. Total corporate revenues reached $45.94 billion, up 14% over 1983. Earnings did even better, up 20% to $6.58 billion. DATAMATION estimates that dp revenues increased 21% to $44.29 billion. The company completed the largest acquisition in its 70-year history. It introduced key new products in all areas, and paved the way for the early 1985 debut of the Sierra generation of mainframes. It reached a settlement with the European Commission, ending the Common Market's four-year-old antitrust case. It continued to develop new technologies, such as a 1Mb memory chip. And it introduced a raft of micro products that helped increase its domination of the pc industry.

The Rolm merger cost $1.26 billion and required administrative reshuffling to transform the Santa Clara firm into a true-Blue IBM operation, but in return it gave IBM an entrée into the PBX market.

IBM itself trotted out key new products, more sharply defining those it considered strategically important. Mainframe introductions included the 308XX interim series, several 4300 models, the 3480 tape cartridge subsystem, and cache-equipped models of the 3880 disk controllers.

In the middle of its line, IBM positioned the System/36 as its choice for departmental level and small business applications. In data communications, the IBM Cabling System disappointed many who had expected the token passing ring network, now scheduled for 1986. In software, IBM extended PROFS and DISOSS to enable mainframes, System/36s, and PCs to interchange final-form documents.

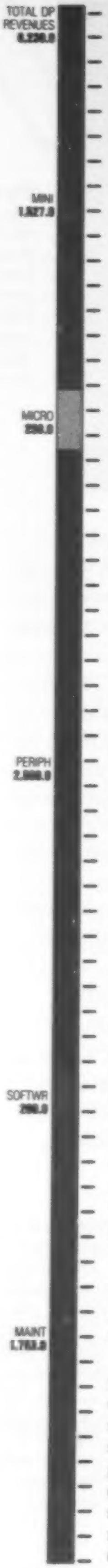
The feisty Entry Systems Division debuted the PC AT—an 80286-based multi-user pc—but supplies dried up due to disk shortages. ESD also premiered its PC Network, developed in conjunction with Sytek, to connect as many as 72 PCs. IBM also entered the micro software market in a big way, at one point bringing out 31 programs. The company shipped nearly 2 million PCs in 1984.

Outside the U.S., the PC finally achieved domination in worldwide micro sales. The EC settlement enabled the company to sell unhindered; the constraint was that it now has to provide detailed interface specs 120 days after product announcements.

The firm realigned its management structure to give more responsibility to foreign operating units, dividing its European operations into five relatively autonomous groups and its Americas/Far East subsidiary into three groups.

The Asia/Pacific unit remained the only subsidiary unable to dominate its market. Since 1979, the unit has trailed Fujitsu in Japanese sales, despite locally developing and manufacturing most of its products like the 5550 kanji workstation and JX pc.

Revenue figures are in millions of dollars. Each increment represents $100 million.



2

DIGITAL EQUIPMENT CORP.

129 Parker St., PK 3-1/552
Maynard, MA 01754
(617) 493-3631

DEC's performance in calendar 1984 left little doubt that its earnings slump a year earlier had been a temporary aberration, the by-product of a messy reorganization. Comparisons of '84 with '83 have therefore been distorted by that uncharacteristic poor showing: net income, for example, grew by a whopping 86% during 1984, to $487 million from $262.1 million. And after suffering the humiliation of being one of the 10 worst performing stocks in 1983, DEC proved to be one of the biggest gainers last year by registering a 54% increase in stock value over the period.

The reorganization that affected Digital's U.S. business in the latter half of 1983 had been implemented earlier overseas. As a result, the company's international sales, particularly in Europe, consistently outpaced domestic growth levels and last year accounted for 35% of total revenues, which grew a healthy 29% to $6.23 billion.

The year 1984 was also one in which DEC's fortunes were tied closely to the vagaries of the U.S. economy. For much of the year the company rode the boom, selling a mixed bag of older VAX technology. But when the economy turned bearish during the later stages of the year, new orders slowed to a 17% growth level, and have continued to soften through the first quarter of 1985. Even surging overseas demand began to slow under the weight of the omnipotent dollar.

The year's end brought a spate of new product announcements, including the long-awaited high-end VAX, the 4MIPS 8600, or Venus, and revamped All-in-One office automation featuring new voice technology.

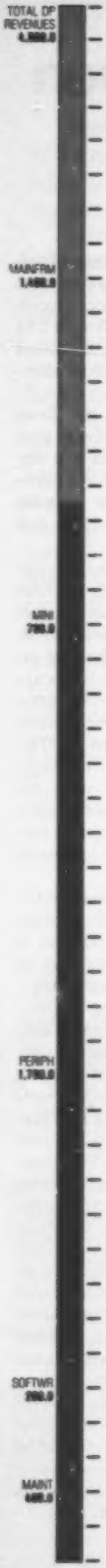
Despite the new announcements much uncertainty remains. DEC has entered a new product transition phase, and so what it can build is not yet in sync with orders. Another problem is DEC's MicroVAX II, which the company effectively preannounced in the fall of 1983, but which it has still not formally unveiled.

Though doubts persist over architectural constraints at the high end of its business, things are now much clearer at the workstation end. The company backed away from an ill-conceived foray into the retail pc business by ceasing manufacture of the Rainbow pc at its Westfield, Mass., plant.

The move is the first phase of a three-year layoff plan. DEC will cut 5,000 workers from its 30,000-strong manufacturing operation to help control costs.

The initiative could also result in improved productivity and return on investment—a case of the company cutting its cloth to fit the user suit. DEC showed last year that it was running a much tighter ship. Its operating margin—sales minus cost of goods, research, selling, and administration—increased to 8.6% from 7.3% over calendar 1984, despite the fact that it was selling older technology and ramping up its new products at the same time.

Revenue figures are in millions of dollars. Each increment represents $100 million.



3

BURROUGHS CORP.

Burroughs Place
Detroit, MI 48232
(313) 972-7000

Business was on the upswing for Burroughs in 1984. The charter member of the mainframers' old-timer club is making headway in its effort to become a service-oriented organization for all its customers' data processing needs—terminals, intelligent workstations, office automation software and nets, and traditional iron.

The firm reported record orders and revenues for the year as well as increased net income. Revenues were up 11% to $4.88 billion from $4.39 billion in 1983. Net income in 1984 was $244.9 million, up 24% compared with $196.9 million in 1983. Fourth quarter orders alone increased by more than 20%.

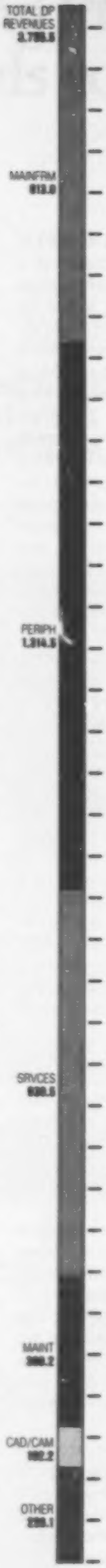
DATAMATION estimates that Burroughs data processing had 1984 revenues of $4.5 billion, up 12.5% from 1983's $4 billion. Sales of the new small- and medium-sized mainframes, the A3 and A9, indicated strong market acceptance. Demand for office automation products, particularly the new B25 workstation and XE520 and XE550 microprocessor-based multi-user systems, helped push Burroughs' workstation and office automation revenues up 30% last year, to $765 million. Burroughs apparently benefited from delays with the IBM PC AT, and analysts say the B25 competes favorably with the AT on a price/performance basis. Analysts even go so far as to estimate that the popular product will provide up to 7% of Burroughs' revenues in '85.

In an effort to increase its market presence for the B25, Burroughs launched plans to expand its network of independent computer dealers to about 450 from 200. The company now makes both products at its own factories.

The year was not without its disappointments. The company's Memorex unit, which contributed almost $1 billion in sales, had disappointing results, due mainly to snags in the plug-compatible disk drive and oem peripherals businesses. Production problems plagued the top-of-the-line 3680 disk drive. Glitches in thin-film head technology were followed by problems in quality control. Assembly lines halted for a time last September, and 3680 production at year-end was lagging behind surging demand. The company is still playing catch-up. The mishaps at Memorex resulted in management shakeups, with a former Storage Technology production executive taking charge of manufacturing. Like Control Data, Memorex dropped out of the oem disk drive business, concentrating instead on its pcm and Burroughs demands. In another cost-cutting move, the company closed 21 production facilities.

For 1985, Burroughs can expect strong pent-up demand for the high-end A-15 processor, introduced earlier this year. And analysts predict that a void in the IBM-compatible reel-to-reel tape drive market will prove to be a blessing for Memorex, one of the few remaining suppliers of the device. Memorex may also benefit from curtailed production by Control Data and Storage Technology of the 3380-class disk drives.

Revenue figures are in millions of dollars. Each increment represents $100 million.



4

CONTROL DATA CORP.

8100 34th Ave. S.
Bloomington, MN 55440
(612) 853-8100

A period of growth and vitality at Control Data Corp. appeared to end abruptly in 1984. Plagued by setbacks in its usually strong computer peripherals and computer service businesses, by increased competition in its mainframe business, and by management shake-ups in its peripherals division, CDC had a rough year. The corporation saw earnings dip 80%, to $31.6 million from 1983's $161.7 million. The news isn't all bad, however. Corporate revenues continued to climb, growing 9.6% to $5.03 billion from $4.58 billion. Dp revenues increased 7% to $3.76 billion.

Though CDC continues to be a leader in the disk drive market, with 1984 sales estimated at $600 million, its market share has steadily shrunk, from almost 50% five years ago to 29%. Analysts say the company has been slow to respond to changes in the market. Last year's substantial drop in earnings is a result of a $70.3 million after-tax charge levied because the company dropped its IBM plug-compatible disk drive business.

CDC also discontinued its Cricket line of 3½-inch disk drives for microcomputers. Drastic price cutting and increased competition from IBM have made matters worse. Insiders say Control Data is now stuck with a huge inventory of overpriced 5¼-inch drives that it must sell at a loss.

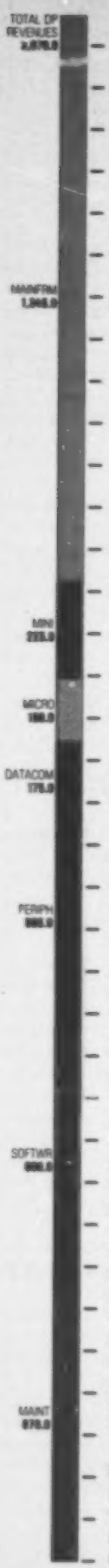
The company recently overhauled the peripheral unit's management, demoting its chief executive and replacing him with Lawrence Perlman. Perlman is credited with turning around the Commercial Credit subsidiary by slashing expenses and changing its market direction.

CDC has a large services business, but analysts say the company has an image problem in that it is perceived primarily as a mainframe manufacturer (mainframes constitute less than 20% of total business) and not a computer services supplier. And even this segment of the company has not escaped stormy weather. Revenues were down in 1984, and profits from CDC's timesharing business, once a fortune-maker, are said to be dwindling. With the emergence of pcs, timesharing is no longer in demand. The company has closed regional Cybernet timesharing centers in California, Minnesota, and Texas in an effort to restore profitability to the business.

The company intends to sell its Commercial Credit Co. unit. While the service contributed 24% of 1984 total revenues, Commercial Credit's involvement in the recent collapse of Ohio thrift institutions has cost it in excess of $20 million. The sale is said to be an indication that the company intends to concentrate its full attention on the dp business.

Amid the turmoil, there's been talk of a takeover—indeed, some analysts say that CDC's best move would be to become a subsidiary of another company. Chairman William C. Norris, however, adamantly opposes a takeover. But it may take serious reorganization for the company to make a comeback.

Revenue figures are in millions of dollars. Each increment represents $100 million.



5

NCR CORP.

1700 South Patterson Blvd.
Dayton, OH 45479
(513) 445-5000

NCR, 100 years old last year, fell short of its goal of revenue growth equal to that of the industry as a whole, with modest growth in major markets such as retail and financial sectors hurting the hoped-for gains. Nonetheless, the 9% improvement brought total revenues to $4.07 billion from the year earlier's $3.73 billion. The 19% net income climb to $342.6 million was skewed by a $30.6 million gain resulting from the DISC tax law changes.

DATAMATION estimates that dp revenues grew a bit better than total corporate revenues, rising 10% to $3.67 billion. While revenue growth occurred in all product areas, the sales gains varied greatly between product categories. Financial terminals revenue inched up 1% in both '84 and '83, and retail terminals revenue rose 4% last year following a 1% climb in '83. And while general purpose terminals produced a healthier 13% improvement in revenues that fell short of the earlier year's 18% increase.

Revenues from general purpose computers, office systems, personal computers, and data communications systems combined to garner an 18% increase in '84, a big improvement over increases of 6% in '83 and 1% in '82. Adding revenues of the three categories of terminals to the computer and datacom systems totals brings NCR's complete hardware and software revenues to $2.4 billion in 1984. Revenues from services (including customer services, dp services, and telecom services) and maintenance round out the remaining third of NCR's total data processing revenues. Together, services and maintenance revenues increased 8% in both '84 and '83.

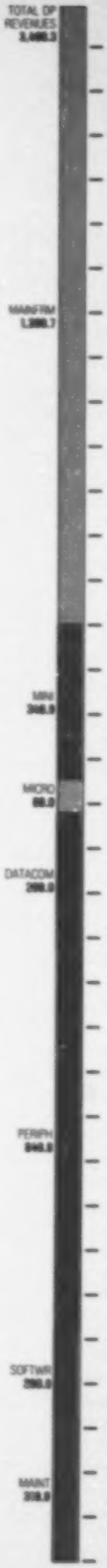
Strong order gains were registered in the U.S. as well as overseas for the Tower low-end processors, the NCR 9300 mainframes, and data communications products. Sluggish sales of office systems and personal computers, however, led to losses.

Already brisk sales of the Tower line were further bolstered when NCR rolled out the Tower XP, which runs Unix System V. Some 75 oems quickly signed up for it. Ironically, one of NCR's current oems is its old archrival and fellow BUNCH member Sperry. NCR is selling its Blue Bell, Pa., competitor $40 million worth of Tower XPs to complement Sperry's across-the-board Unix offerings.

That NCR was in the microcomputer business last year seemed to be a well-kept secret in an industry that has few. Sales of the PC 4 and PC 5 micros, aimed at the oem market, were so slow that the PC 4 was taken out of domestic production in the fall. The fate of Decisionmate V, NCR's IBM-compatible pc, doesn't look especially promising either. Even with a $20 million ad campaign and the creation of its personal computer division, NCR is having trouble establishing itself as a pc vendor.

With old markets waiting for new products (incorporating the 32-bit chip set) and new markets ramping up to profitability, it's doubtful that NCR will reach greater revenue growth in '85. Maybe, like a good wine, NCR just needs a bit more time to age.

Revenue figures are in millions of dollars. Each increment represents $100 million.



6

FUJITSU LTD.

Marunouchi Center Bldg.
1-6, Marunouchi 1-chome
Chiyoda-ku Tokyo 100, Japan
(81-3) 211-5236

The flagship of the Japanese computer industry profitably sailed through the turbulent IBM waters that overwhelmed other pcmers in 1984. Corporate revenues soared 26.4% to a healthy $6.44 billion (Y1.53 trillion). DATAMATION estimates that Fujitsu posted 1984 worldwide dp sales of $3.50 billion for an annual upturn of 25%.

The Japanese market accounted for about three quarters of Fujitsu's revenues. Worldwide pcm sales also helped pump up profits. A weak yen certainly contributed to exports, but so did the popularity of Fujitsu's peripherals. Analysts estimate Fujitsu's shipments of 3380-compatible hard disk drives jumped 50% during 1984.

On the home front, Fujitsu focused on consolidating its market dominance by keeping Big Blue at bay. The pressures of Fujitsu's software squeeze eased in 1984 with the introduction of a new operating system for its M-series mainframes and the rewriting of substantial portions of code to escape patent-infringement charges and costly cross-licensing from IBM. In the domestic mainframe systems replacement market, Fujitsu took away almost 40 installations from IBM, while IBM took only 10 of Fujitsu's replacements. Fujitsu continues to meet the needs of the world's second largest computer market with applications software, a Japanese language processing capability users prefer over IBM's approach, and user training and support.

Nevertheless, except for Asia, Fujitsu continues on a path of oeming to partners with stronger sales and services networks. Despite its position as the leading IBM alternative in 1984, Fujitsu gave no indication that it would soon sell mainframes under its own name in either America or Europe.

Recognizing a major weakness, Fujitsu continues to make all-out efforts to create a clan of external allies to bolster software support. Heavy investment in partially and wholly owned software subsidiaries and successful efforts to bring independent software houses into the Fujitsu fold has paid off. With software subsidiaries planted and nurtured in 1984, Fujitsu is ready to target niche applications markets in communications, office and factory automation, and finance that have long eluded its grasp.

An internal data communications network placed all subsidiaries and affiliated companies on line with each other when Fujitsu moved into its new coporate headquarters in December 1984. A Fujitsu network engineering subsidiary was created to develop and market similar VANs to large corporations. Fujitsu's technological prowess in fiber moved into the commercial arena as its communications customer base blossomed with the opening of the Nippon Telegraph & Telephone optical fiber trunk line in October 1984. Although the communications division hauled in an estimated 16% of 1984 sales, it was the sole drag upon earnings because of the continuing burden of development costs.

Revenue figures are in millions of dollars. Each increment represents $100 million.

7

SPERRY CORP.

1290 Avenue of the Americas
New York, NY 10104
(212) 484-4278

Univac to Unix was more than dropping a name and picking up a technology at Sperry. The year 1984 was a time of transformation that resulted in a revamped product line (Unixvac?) and new management style.

In an effort to build the company at a faster rate, Sperry is offering a complete line of Unix computers, including micros, minis, and mainframes as well as related products. All of them run under the AT&T-supported Unix System V. Sperry also continues to support its proprietary operating system.

Sperry's 1984 dp revenues were up 13% over 1983, rising to $3.47 billion. Mainframe sales accounted for $1.45 billion, minis $57.8 million, microcomputers $503.4 million, data communications $177.6 million, software $208.1 million, computer services $180.6 million, and maintenance and repair $665.4 million.

All market segments showed increases except minicomputers, which were down 17% from $69 million in 1983. Total corporate revenues were $5.37 billion, compared to $4.75 billion in 1983. Corporate income for the year was up 46.7% over 1983 to $267.6 million.

Sperry does 30% of its dp business overseas—23% comes from Europe, 6% from the Far East, and 1% from other regions. Despite the fact that Europe is Sperry's second largest international sales region, Japan is among the top three national sales areas, tying with Germany and Canada. In fifth place is the United Kingdom at 3%. The United States is still the company's largest market at 67%.

Building on sales spurred by the economic recovery that started more than a year ago, the Information Systems Group reorganized its structure, hoping for more decentralization of responsibility and for an enlarged spirit of entrepreneurship. As a result, the company is oeming all of its micro and mini product offerings.

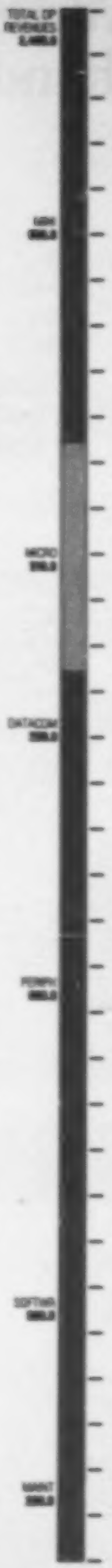
The company has abandoned the "not invented here" attitude in an attempt to bring products to market faster. Various divisions within the ISG were also restructured.

New product offerings included Mapper 5, a fourth generation language microcomputer capable of either standing alone or serving as a mainframe connection. Other products launched in 1984 included a portable micro, the Sperry Computer Integrated Manufacturing/Mechanical workstation (Sperry's entry into CAD/CAM), and the Usernet local area network. These products too were oemed.

The 1100 series has the distinction of being one of the only new products developed in-house. Sales were healthy and by November, 47 of the 1100/90s, valued at $74 million, had been shipped. Bookings as of Nov. 30 totaled 143 systems with a total value of $753 million.

The company also reports there is life in the 1100/60 and 1100/70 systems. Orders for these two products exceeded $1 billion as of Nov. 30.

Revenue figures are in millions of dollars. Each increment represents $100 million.



8

HEWLETT-PACKARD CO.

3000 Hanover St.
Palo Alto, CA 94304
(408) 857-1501

From atop a great pile of money, Hewlett-Packard looked down upon 1984 and liked what it saw. Corporate revenues were up 27.6% to $6.29 billion, from $4.93 billion a year earlier. Net income for 1984 was up 52% at $665 million, which includes a $118 million windfall from DISC. In a year when a strong dollar crimped the international sales of many, HP's overseas orders still totaled 43% of corporate revenues, up from 40% the year before.

Other corporate numbers also showed gains. Backlog orders for 1984 amounted to $1.3 billion, compared with $1 billion in 1983. HP's net cash balance remained virtually unchanged at $720 million. Total employment stood at some 80,000 in 80 countries where some 9,700 computer-related products were being sold. About half of HP's revenues, and slightly less than half of the company's profits, were derived from cpus and peripherals.

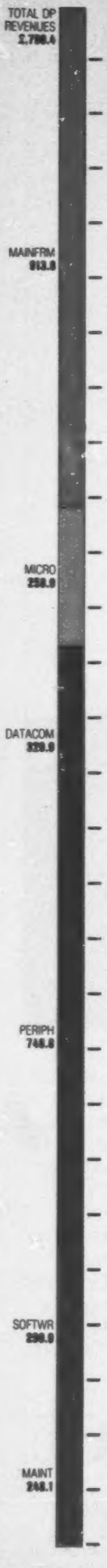
What seemed new was HP's militant entry into the office automation field, which it based upon its installed base of almost 17,000 Series 3000 minicomputers. Within the portmanteau of Project Spectrum, HP planned to introduce RISC technology into all of its microcomputers and minicomputers, which could make it one of the fastest MIPS movers in town. HP's $592 million investment in assorted R&D projects, which included RISC, represented 9.8% of sales revenues.

HP looked towards the East while others were mining more traditional lodes, and formed a joint venture with the China Electronics Import and Export Corp. and the Beijing Computer Corp. to sell and support gear that has yet to be disclosed. HP also did a deal with Mexico's DESC Sociedad de Fometo Industrial, S.A. de C.V., wherein the latter will build and distribute HP 150 touch-screen personal computers and future related products. HP owns 49% of the Mexican venture.

At the same time it was cutting costs, Hewlett-Packard released a variety of new products designed for business and scientific applications. Among them were the HP 3000 Series 37 business computer, based on CMOS technology and which the firm claims offers all the performance of a three-full-bay HP 3000 Series III of only three years ago. More an option than a standalone product was the Personal Productivity Center, which runs off any 3000 and supports up to 80 electronic mail sessions. Additional office equipment included the portable micro, the ThinkJet personal micro printer, and the LaserJet desktop printer.

Still, HP has a way to go to establish a heavy office presence in distibuted data processing. While the firm remains number one in test and analytical instruments and number two in minicomputers, it holds a lesser place among leaders in the market for $1,000 to $5,000 micros. DATAMATION also estimates that micro sales account for less than 5% of HP's revenues, but 5% of more than $6 billion is hardly small beer.

Revenue figures are in millions of dollars. Each increment represents $100 million.



9

NEC CORP.

33-1 Shiba 5-chome, Minato-ku
Tokyo 108, Japan
(81-3) 454-1111

NEC has been nuturing its dp sector with a passion, and more than one third of its $7.59 billion corporate revenues now comes from dp. Anxious to promote itself as a high-tech superpower, NEC has followed the familiar formula of touting its computer and communications capabilities. These capabilities are indeed formidable, particularly on NEC's home turf, where it derives 80% of its dp and datacom sales, which DATAMATION estimates totaled $2.79 billion in calendar 1984. NEC, which ranks as Japan's third largest dp supplier, has the most muscle domestically in the mainframe and micro fields. It has captured close to 70% of the Japanese micro market, an achievement even IBM would envy. The company has also shown significant strength on the telecom side, with its big push in PBXs. The Japanese company currently owns about 8% of the world PBX market.

NEC's largest foreign market is North America, where it pulls in 7% of its dp and datacom revenue. So far, NEC has had mixed results in the U. S., where sales of its micros and small business systems have been decidedly sluggish. The outlook for NEC PBXs in the U.S., however, is much brighter. The company currently has roughly 10% of the U.S. switching market. The product to watch in that market is the NEAX-2400 digital PBX, which has won juicy contracts from the divested Bell operating companies.

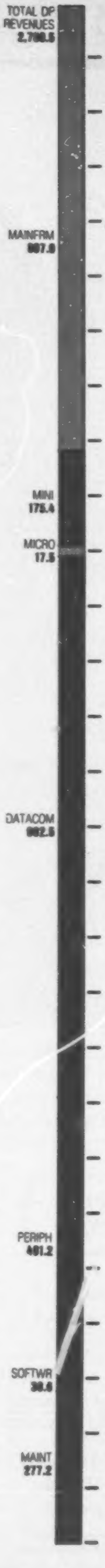
Last year NEC was very active in the American arena. In March it signed up Honeywell to distribute its large System 1000 mainframe (called the Acos 1000 in Japan). Earlier this year NEC returned the favor to its partner and agreed to buy Honeywell's slumping Japanese operation.

On the communications front, NEC combined forces with GE in the United States. The two companies are collaborating on an international network service that will connect NEC's value-added network in Japan with GE's 600-city network in the U.S. NEC also got together with Hewlett-Packard Ltd. in Japan to produce a micro development support system. The Japanese company was busy in Europe as well last year. Broadening its Continental business base, it opened up NEC Business Systems (Deutschland), which will handle peripherals, business computers, and fax machines. In France, NEC teamed up with Bull in a distribution agreement for the Acos 1000.

The Acos mainframe got a new operating system in 1984. Called the MS-UX, the Unix lookalike was available only in Japan. The company also came up with new 16-bit and 32-bit models for its 150 minis. The most unusual development, however, was the OBC-I, the world's smallest computer to be mounted on a satellite.

This year NEC became the first Japanese mainframer to challenge IBM's Sierra. NEC, which announced the air-cooled Acos 1500 series in March, claims a performance of 37MIPS for the system's uniprocessor. Indeed, it's at the high end of the market where the determined NEC could nick IBM and climb even higher in the dp domain.

Revenue figures are in millions of dollars. Each increment represents $100 million.



10

SIEMENS AG

Wittelsbacherplatz 2
D-8000 Munich 2, West Germany
(49-89) 2340

It was a watershed year for West Germany's national mainframe maker in 1984. Siemens is one of those large European electronics firms that seems to have more in common with a bureaucracy than a fast-track, high-tech company. The German giant pulled in total revenues of $16.08 billion (DM45.82 billion) last year. Siemens' dp operation accounted for roughly 17% of that take, with sales of $2.79 billion (DM7.9 billion).

DATAMATION estimates that this sum breaks down with mainframe revenues reaching $807 million, minis at $175.4 million, and micros at $17.5 million. Siemens' largest revenue producer is the data communications sector, where revenues were an estimated $982.5 million. The peripherals and terminals area is also large, with revenues hitting about $491.2 million. The rest of Siemens' dp revenues come from other areas of the company with smaller dp interests, such as the Power Engineering and Automation Group and the Components Group.

Siemens' management realized back in '83 that it had a structural problem and immediately initiated an overhaul. Last year it completely reorganized its dp and telecom operations to better integrate computer and communications technologies. Starting in April of '84, the old Data Systems Group and parts of the Communications Group were merged into a new Communication and Information Systems Group (CISG), which the company says has responsibility for "everything concerning the office." That includes dp systems, terminals, and PBXs.

In the office automation arena, the company is putting its money on the EMS 5000 range of office computers and the new Hicom digital PBX. Siemens has always had a strong presence in the office market through its telephone, telex, and typewriter sales, but it has recently lost ground in the transition from these to newer dp-based office tools.

Stateside, Siemens inked an agreement with Valid Logic Systems to tie its CAD systems to Valid's CAE workstations. Back in Europe, the company joined 12 other local vendors lending support for Open Systems Interconnection standards. Later last year, Siemens teamed up with ICL, Bull, Philips, Nixdorf, and Olivetti to form a European Unix group.

Although represented in 120 countries, Siemens does around 50% of its dp business in West Germany. Another 22% comes from the rest of Europe, while the U.S. accounts for 10%. Even in its home market, Siemens dominates only around 20% of the computer business, and its long-awaited pc had little success last year. Nevertheless, mainframe sales remain strong, thanks to the company's longstanding links with many of Germany's engineering, industrial, and commercial companies. Most of these mainframe sales (over 80%) were for its 7.500 range. As part of its support plan for mainframe users, Siemens also took a major step foward on the peripherals front last year when it signed up to oem 3380 disk drives from IBM.

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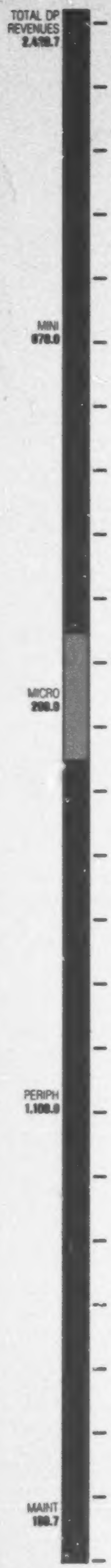

11

WANG LABORATORIES INC.

1 Industrial Ave.
Lowell, MA 01851
(617) 459-5000

One story in 1984 was of Wang's familiar success: the company milked its fat word processing cow for the ninth straight year, aided by a lively economy and strong overseas business. Total revenues climbed 35% to $2.42 billion, and net income grew a healthy 29% to $230.7 million. Gains in the Far East inched the company's international business up to 29% of the total.

That was one story—the old story. By the time the first leaves fell to the ground to herald the year's final quarter, a new story was emerging, and storm clouds were gathering over Wang's future as a dp and integrated office systems company. Corporate revenues, which in the first three quarters had grown at 36%, 51%, and 34% over year-earlier periods, slumped dramatically to 18%; equipment sales also slowed to 18%, and orders fell to half their summer level. Suddenly the company was being hit by canceled and deferred orders—a pattern that has continued through 1985.

Now, increasingly skeptical customers doubt whether the firm can convert its word processing preeminence into leadership in the more sophisticated office automation sector. Many now feel that Wang, for years the heir apparent to the OA crown, will have to settle for a niche postion and half its former growth levels of 30% plus.

Wang's problems are not new, but until recently they had been cloaked by its spectacular growth. In 1984, however, Wang's image as a technological leader was significantly tarnished by delays in shipping key products, such as its Wang Office software and its VS 300 supermini.

Other products either failed to live up to expectations, didn't work as specified, or were considered irrelevant by customers (WangNet, PIC, and the Digital Voice Exchange).

The net result is that Wang's ability to supply a total and broad solution (including handholding) has been brought into question. To succeed in transforming its word processing leadership into dp strength, Wang can't just be a little better or a little cheaper than IBM and the others; it has to stand head and shoulders above them.

These doubts couldn't come at a worse time for the company. Its word processing business (OIS) is decelerating faster and from a higher base of orders than its dp business (VS) is accelerating. OIS orders totaled $900 million in fiscal 1984 (ended June 30), growing less than 15%. Since then, OIS growth has been put by analysts at closer to 5%.

Wang is countering these problems by aggressively marketing its VS systems and by breaking out of its former proud isolation to form a number of partnerships and joint ventures. There are also signs that management is running a tighter ship. A tight rein on expenses put in place last year has begun to take effect, and head count is growing at only a modest rate. Still, Wang appears to be in for a bumpy ride in the years ahead.

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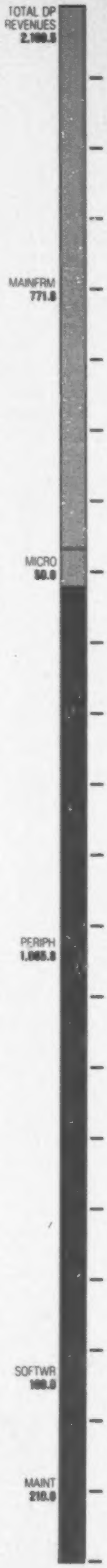

12

HITACHI LTD.

Kanda-Surugadai 4-Chome
Chiyoda-ku, Tokyo 101, Japan
(81-3) 258-1111

Hitachi had cause for celebration in 1984. During its 75th anniversary, Hitachi's revenues rose by an estimated 15% to $21.05 billion (Y5 trillion), while profits advanced more than 17% to $824.8 million. Not bad, considering that the previous year Japan's number four computer maker was eating humble pie after getting fingered by IBM for stealing software. The resulting settlement with IBM barely caused a ripple in the 1984 cash flow. Rewriting software took time, but absorbing a lesson in humility made Japan's giant energy and electronics conglomerate reconsider the rough and tumble nature of the pcm business.

The electronics division that includes Hitachi's computer business accounts for about 60% of total profits but only 31% of total sales. Semiconductors have been the real cash cow. Lavish R&D expenses, growing about 12% annually, help Hitachi keep up with and occasionally set the pace for competitors. This R&D spending has helped the company develop a technological autonomy unusual for a Japanese corporation. Hitachi poured mega-yen into developing gallium arsenide LSI and Josephson junction gate arrays. Profit margins improved with a shift from 64K to 256K DRAM production in 1984. This didn't hurt Hitachi's computer business a bit, since nearly 75% of Hitachi's semiconductors find their way into the company's computer wares.

Hitachi played on price/performance to eat into IBM's mainframe market share both at home and abroad. Computer exports jumped 16%, with North American partner National Advanced Systems taking about half of those shipments. BASF and Olivetti in Europe took most of the other half. China and other Southeast Asian nations purchased some small systems directly from Hitachi.

Advanced thin-film magnetic head technology allowed Hitachi to increase sales of IBM 3380-compatible storage devices by more than 30% in 1984. The unveiling of erasable optical disk prototypes showed Hitachi's potential in peripherals. Toward the end of the year Hitachi hinted that shipments would begin by the end of 1985.

Under the terms of the IBM settlement, the company must allow Big Blue to scrutinize any of its new products. That doesn't seem to frighten Hitachi, which is gaining confidence in its software capability. Indeed, last year Hitachi software engineers matched IBM's extended channel architecture and helped prepare a response to Big Blue's Sierra. The much touted Hitac S-810/20 supercomputers found homes at Japanese universities and at Hitachi research labs. Software development at Hitachi focused on developing in-house programming productivity tools and expert systems applications in the sluggish nuclear power industry.

Hitachi, which derived less than 10% of its '84 revenues from telecom sales, is notoriously weak on the communications side. This weakness promises to slow Hitachi's efforts to sell integrated data processsing systems.

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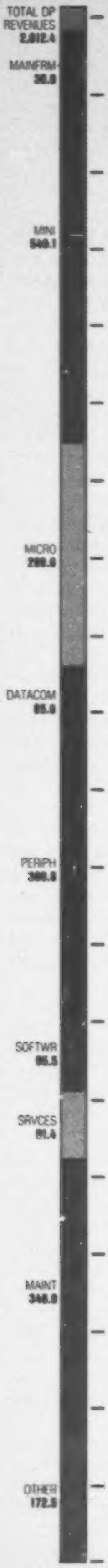


Revenue figures are in millions of dollars. Each increment represents $100 million.

13

ING. C. OLIVETTI & CO. S.P.A.

Via Jervis 77
10015 Ivrea, Italy
(39-125) 525

Last year was probably the most crucial for Olivetti in its 77-year history. Back in 1978, when chief executive Carlo De Benedetti took the helm, the company was a financial wreck. By 1984 he'd made the Italian office equipment supplier seaworthy enough for AT&T to jump on board feet first.

Group revenues last year totaled $2.89 billion, a 36% increase measured in local currency. Dp sales of about $2.01 billion (L3.5 trillion) were also up. AT&T last March bought 25% of the Italian company for $250 million, and signed a series of agreements making Olivetti its European partner for office automation products. Through this accord, the American giant also got its hands on some of Europe's best-designed terminals and pc products. It also got the chance to up its stake to 40% in 1988. And last but not least, AT&T got a nine-year commitment from Olivetti boss De Benedetti.

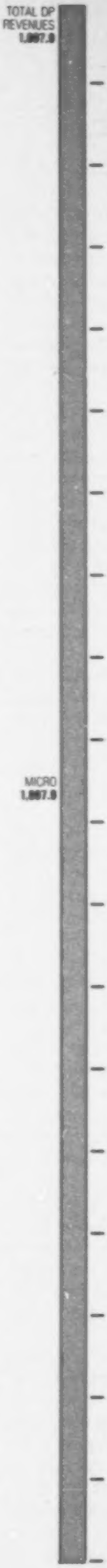
Olivetti, of course, got what it wanted too. In addition to the massive cash injection, it gained European distribution rights to AT&T's PBX line, to its 3B minicomputer series, and to its Unix operating system. Less tangible but no less valuable, the Italian company dramatically enhanced its credibility as a truly international office systems supplier.

The Italian firm has forged marketing and technological links with companies around the world and now has interest in some 30 concerns in the U.S., Japan, and Europe. Included on the American investment list is Stratus, which recently inked a deal to supply IBM with fault tolerant machines; pcmer IPL Systems; and VLSI Technology Inc. Perhaps the firm's biggest U.S. mistake was automatic teller machine vendor Docutel. This venture went sour, resulting in losses and litigation. Olivetti is now bidding to take control of the company.

Olivetti's two main European subsidiaries, Swiss office products company Hermes Precisa International and French dp systems vendor Nouvelle Logabax, both performed well in 1984. Earlier this year it bought a 49% stake in U.K. micro maker Acorn. To expand its marketing base in Europe, Olivetti bought Exxon's European sales network.

Olivetti is hoping that all of these acquisitions will give it a much-needed technological base and boost its sales, particularly in the U.S. Stateside sales account for only 11% of the company's take. Most of its overall sales still come from its Linea Uno mini range and office terminals. It also distributes Hitachi mainframes in Italy. Last year the company's M24 pc, one of the most successful European micros, was taken across the Atlantic, where it was sold by AT&T as the PC6300. Olivetti also took orders for 1,000 AT&T Unix-based machines, which were oemed.

Despite all the progress made last year, the company still has a few problems. The Unix Europe joint venture is moving slowly, and AT&T is not the marketing arm De Benedetti had hoped. But Olivetti is at last financially sound and has a more watertight future than at any time in the last 30 years.



Revenue figures are in millions of dollars. Each increment represents $100 million.

14

APPLE COMPUTER CORP.

10260 Bandley Dr.
Cupertino, CA 95014
(408) 973-3145

Apple Computer Corp. plays perennial second fiddle to IBM in the personal computer orchestra, but as a soloist Apple sounded a loud and clear cadenza in calendar 1984. With Macintosh, its new 32-bit micro, and an expanded Apple II line, Apple played on key once again, recovering from the disappointing performances of Apple III and Lisa.

Both revenues and earnings skyrocketed about 75% over 1983's figures. Revenues for calendar 1984 jumped to $1.89 billion, and net income rose to $104.3 million. Despite all the attention paid to the Macintosh line, the new box contributed only 34% of Apple's total revenues. The grizzled old veteran Apple II family contributed a strong 58% of the total revenue, down from the nearly 70% it accounted for in 1983, but still registering a strong gain. Apple's remaining revenues came from maintenance.

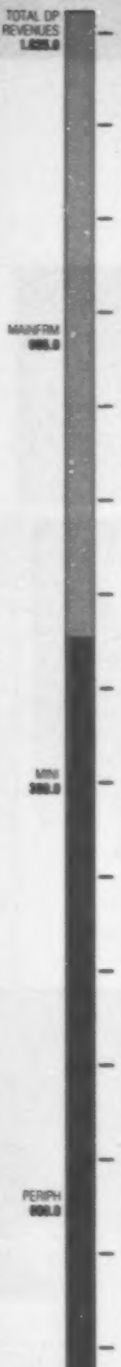
Apple leaped into 1984, introducing Macintosh with its now-famous Super Bowl commercial telling us why 1984 wasn't going to be like *1984*. Following on Mac's heels came the release of the Apple IIc, a "semiportable" upgrade of the Apple II. The IIc's flat panel display failed to materialize, however, requiring users to hook it up to a full-size monitor. Later in the year, Apple expanded Macintosh to 512K from 128K. Macintosh's predecessor—Apple's 1983 icon-based pc offering, Lisa—died an unmourned death, although the 2/10 version was reborn as the Macintosh XL.

Apple has proved it can learn from its mistakes. One of them was trying to sell Lisa through a national sales force. The Lisas didn't sell, and what's more, Apple's dealers were alienated. Apple took those dealers back into the fold in 1984, dumped its independent manufacturers' representatives, and hired 350 new dealer sales and support people.

Although Apple sold about 250,000 to 300,000 Macs—more than any other micro has sold in its first year—the firm failed again to penetrate the corporate market. That task was put on the agenda in 1985, when Apple introduced "The Macintosh Office," a group of products based around Macintosh that includes a laser printer and a local area network.

Despite a strong year, sales of both Apple IIs and Macs were slower than expected in the fourth quarter. Inventories piled up throughout the retail channel, prompting Apple to close its four manufacturing plants for a week in early 1985.

Another surprise in early 1985 was the departure of Apple cofounder Steve Wozniak, who said he was resigning because he felt the Apple II, which he designed, was being slighted by Apple management. Wozniak's *sayonara* was only the tip of an iceberg of employee discontent at Apple. A number of other senior and middle managers and top engineers quit or announced retirement as well, including Joseph Graziano, chief financial officer; Kenneth R. Zerbe, vp of operations in Latin America, the Far East, Africa, and Canada; and Delbert Yocam, executive vp and general manager of the Apple II division.



15

HONEYWELL INC.

Honeywell Plaza, P.O. Box 524
Minneapolis, MN 55440
(612) 870-2520

Honeywell recorded modest gains through the year, with revenues rising 7% to $6.07 billion. Net income inched up 3.3% to $239 million, but much of the increase was due to a change in the tax law. The earnings decline was caused by its Synertek operation, which was written off at year-end at a cost of $70.6 million. The Information Systems division, however, notched its second consecutive healthy year. The only one of Honeywell's five divisions in the dp industry, HIS saw revenues gain almost 10%, to $1.83 billion, while operating profits jumped 37% to $180 million and operating margins expanded from 7.9% to 9.9%.

Most of the credit for the rebound goes to "Neutron Jim" Renier, the division's president until he was promoted into Honeywell's newly created executive office early in 1985. Since 1982, Renier has slashed expenses, notably on the payroll, earning him his nickname. As one survivor said, "All the buildings are still there. It's just the people who are gone."

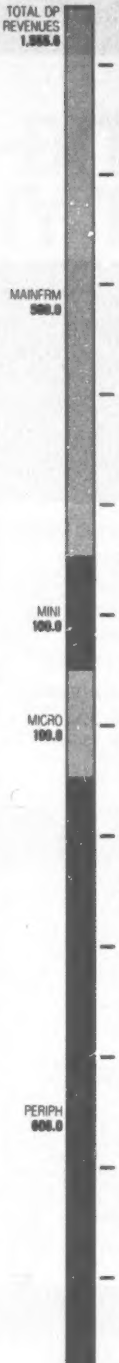
HIS also cut costs by signing a 10-year pact with NEC, the Japanese mainframer. NEC will provide Honeywell with high-end mainframes to remarket to its 500-site U.S. installed base and to Italian and British customers through its two European subsidiaries. Honeywell's French business partner, Bull, will sell the same systems elsewhere in Europe, and NEC will market them to the rest of the world. Honeywell will continue making its own DPS family of smaller models in its Phoenix facility. In 1984, HIS introduced the DPS 88/40 series of midrange mainframes from Phoenix and early in 1985 it debuted its line-topping DPS 90 mainframes from NEC.

Despite the new products, however, HIS's mainframe business remains in crisis. The user base is too small, many observers feel, to generate the revenues needed to develop and upgrade systems. Also, for years customers have complained of a lack of third-party software for the GCOS operating system. (While Bull endorsed Unix for its version of the NEC mainframes, HIS has declined to do the same.) Orders slackened toward the end of the year, and HIS is now predicting slower revenue growth in 1985.

Following the mainframer's lead, other HIS products are increasingly being built by other companies to HIS designs. Among the new products offered in 1984 was the NX, a single-user, Unix-based engineering workstation built by Corvus Systems, and the OMS 40 and OMS 90 office automation systems, built in-house. Honeywell also signed with NCR to use NCR's 32-bit chips in its next generation of DPS 4 minis.

HIS jumped with both feet into the factory automation marketplace, a niche that analysts say could be lucrative because the popularity of Honeywell's control products has paved a path to acceptance. HIS premiered the series 4000 to simplify the collection and validation of data entered from the factory floor. It also introduced U.S. users to its Distributed Manufacturing System, developed in the U.K.

Revenue figures are in millions of dollars. Each increment represents $100 million.



16

GROUPE BULL

121 Avenue de Malakoff
BP No. 193-16
75016 Paris, France
(33-1) 502-1080

Traditional French tenacity seems to be paying off for the country's national dp hero. In 1984 Bull continued its determined march to get back on a more solid financial footing. Revenues climbed to $1.56 billion (FF13.6 billion), an increase of 16.8% in French francs.

Bull still lost money, but not as much as it did in 1983, when the net loss hit $82 million. While last year's net loss was a hefty $56 million, it still represented a 22% improvement over the prior year. The revenue growth was also significantly below the 21% gain achieved in 1983, and the proportion of revenues generated outside France fell from 38% in 1983 to 36.6% last year. That trend should worry Bull, since it is trying to strengthen its international business.

Bull hopes to be back in the black in 1985, a year earlier than the 1986 target set by the French government, which took control of the company three years ago. The French government, which is still injecting capital into the company, pumped $110 million into Bull last year.

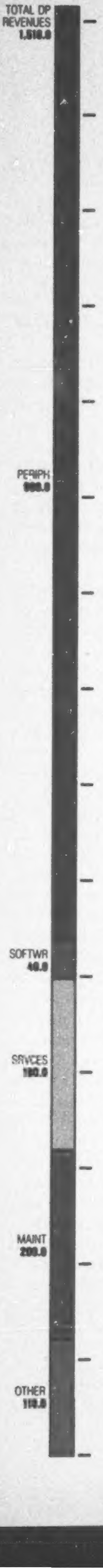
Following the merger of four French data processing companies—CII-Honeywell Bull, Transac, Sems, and R2E—to form Groupe Bull in 1983, the management worked hard last year to revamp the product line and forge links with European and U.S. suppliers.

Bull's primary agreement is with Honeywell and NEC, covering the exchange of patents, copyrights, and manufacturing licenses. It also gives Bull the right to market NEC's 1000 processor and Honeywell's GCOS 8 operating system in most of Europe. Four models of the mainframe line will hit the market in 1986. Complementing its investment in GCOS, Bull spearheaded a drive to unite Europe's dp industry behind Unix. Six major vendors agreed to support common Unix programs. Philips in Holland also became a Bull partner last year. The two European heavyweights are jointly developing smart cards, a credit card with embedded microprocessor and memory. Soon after this, Bull announced an agreement with California's Ridge Computers and came out with the Ridge 32-bit Mega-mini scientific minicomputer.

On the product front, the greatest splash was created by the IBM PC-compatible Micral 30 micro. This machine was only one of a host of products that debuted last year; others included micros, workstations, and a new range of large minicomputers called the DPS 6. Bull also enhanced its DPS 7 mainframe line with a new operating system, GCOS 7, to replace the GCOS 64-E.

Looking to the future, Bull joined Germany's Siemens and the U.K.'s ICL in a joint research venture to develop AI software. The French firm hopes for commercial spin-offs from a development project with the French military to design Europe's first indigenous supercomputer.

Revenue figures are in millions of dollars. Each increment represents $100 million.



Revenue figures are in millions of dollars. Each increment represents $100 million.

17

XEROX CORP.

P.O. Box 1600
Stamford, CT 06904
(203) 329-8700

The computer industry wouldn't be where it is today without Xerox. This, let us not forget, is the company that was here first with the personal computer and the office network. Then again, Xerox wouldn't be in the trouble it's in without the computer industry. It seems as though every time Xerox ventures outside the copier area, it hits a dead end.

So why should 1984 have been different? Well, it wasn't. Xerox began the year by introducing two new products in its 8010 Star workstation line, where it hoped (and needed) to "dramatically improve sales." Xerox finished 1984 by pulling the plug on its Shugart Corp. disk drive operation.

It was the third strike for Shugart, formerly one of the "Big Three" small disk drive makers. Xerox had bought Shugart for $41 million—that's 1977 dollars—to try to establish a broad manufacturing base in the computer business. Seven years later it decided "the Shugart businesses aren't important to the company's long-range plans." And rather than "invest in a long and costly recovery program," it would make "an orderly exit from the business."

Corporate revenues managed to surmount this chaos, rising 6.3% to $8.79 billion from $8.27 billion. They had been flat the year before. The copiers, duplicators, and information systems pieces more than pulled their own weight. They were up 14%, finishing at $2.51 billion compared to $2.2 billion in '83. Dp revenues did even better, jumping $1.16 billion to $1.52 billion, a 31% increase.

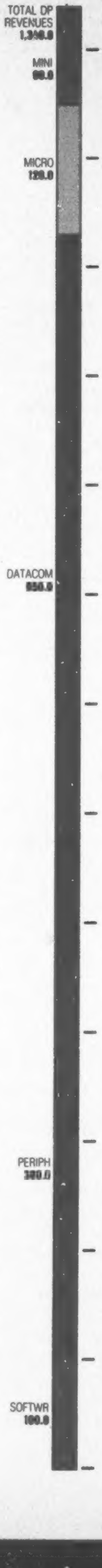
So why did president David Kearns admit it was a "difficult" year? Because after a 27% rise in 1983, net income did a quick about-face. It dropped 34% to $290 million from $466.4 million in 1983. That took some doing, since profits in the copier and information segments leaped 8% for the year. Xerox even made company history, although not the kind of which it wants to be reminded. For the first time since copiers were introduced in 1959, Xerox had a quarter in which it lost money—$12 million in the final period.

The insurance business didn't pay much of a premium in 1984. Crum and Foster, the casualty and property group that Xerox bought for $1.6 billion in 1983, lost $10 million for the year, compared with earnings of $145 million in 1983.

It wasn't all downers. Xerox Computer Systems saw revenues soar 38% to $180 million from $130 million. Early this year, XCS scored some much-needed points when it beat out several rivals for a contract to provide factory automation for a General Motors' Delco-Remy plant. That triumph should open the way for more business from GM.

The company also began this year the same way it started 1984—with a new product. The 1090 Marathon copier can make 92 copies a minute, compared with 70 for the previous high-end 1075 machine. But for an additional $37,725, a buyer ought to get more bang for his copier buck.

Then again, that's Xerox's business.



Revenue figures are in millions of dollars. Each increment represents $100 million.

18

AT&T CO.

550 Madison Ave.
New York, NY 10022
(212) 605-5500

Divestiture is a thing of the past, AT&T isn't Ma Bell anymore, and the question persists: what is going on there? Consultants in marketing, corporate culture, and organizational structure stack up in AT&T lobbies like planes at O'Hare; it's rumored that chairman and ceo Charles Brown can quote from memory whole passages of *In Search of Excellence*; Bell Labs and the new R&D centers in the Midwest are hip-deep in genius; and still AT&T can't manage to convince people it's going to sell what it says it wants to sell.

But 1984, AT&T's first full year without the telephone exchanges as the heart of its business, did produce some encouraging numbers for the corporation. DATAMATION estimates that total dp revenues were up 24%, to $1.4 billion from $1.08 billion. Data communications revenues hit $650 million, up a bit from $625 million; software sales rose to $100 million from $75 million; and peripherals stayed flat at $380 million. Most of the increase in dp income came from products that AT&T hadn't before been able to sell outside its captive market of telephone operating companies: computers.

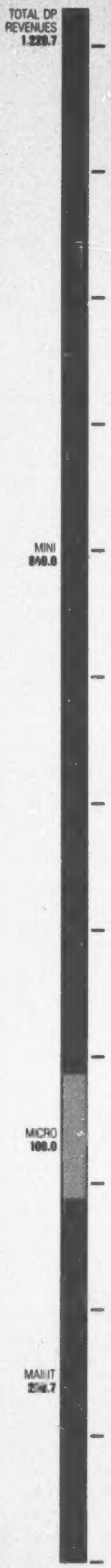
DATAMATION estimates that in 1984 AT&T sold about $120 million worth of microcomputers and about $90 million worth of its Unix-based minicomputer line. But there's no real occasion for joy in these numbers and, apparently, not a lot of profit: estimates of what AT&T spent to promote its well-reviewed IBM PC clone, the 6300, are so high as to be almost unbelievable.

Why weren't sales bigger? Reports of bickering between marketing and manufacturing, between manufacturing and development, and between development and research are nothing new at AT&T, but in 1984, with all eyes on the fledgling monster, they seemed more noticeable. Also, the almost uniformly strong performances posted by the freed operating companies made AT&T's unthrilling 1984 performance all the more embarrassing.

A bright spot in AT&T's computer story was the continued interest in its Unix operating system. The announcement in 1985 of AT&T's Unix-based 7300 pc has heightened activity. With companies throughout the industry looking for a non-IBM operating system that might make an acceptable standard, Unix systems were announced almost weekly. But while the tide seems to be turning toward AT&T's proprietary Unix System V, several non-AT&T Unix systems are grabbing a lot of this market.

AT&T has been signing up partners everywhere, but rumors persist that its deal with Olivetti hasn't given AT&T what it wanted, and that its venture with Philips hasn't yet broken through.

But the welcome mat is still out for would-be joint venturers. Inmos in the U.K., United Technologies and Convergent in the U.S., and the mighty Japanese MITI are all working on specific projects with AT&T, and reports this spring of an attempted deal with DEC also showed AT&T's eagerness to find ready-made paths into the heart of the dp business.



19

DATA GENERAL CORP.

4400 Computer Dr.
Westboro, MA 01580
(617) 366-8911

Like some faded Hollywood star suddenly handed the script of a lifetime, Data General has staged the comeback of all times. Four years ago this 1970s hotshot was being measured for a casket, but there was a spark inside that wouldn't be dimmed. Three years ago we detected signs of life and animation and in 1983 a gathering momentum.

In 1984 would we see the company surge through the $1 billion barrier or fall back in disarray? As it turned out, this Orwellian year was a banner year for Data General.

DG has repositioned itself from a gun-toting 16-bit oem box seller to a full-service commercial operation with major thrusts into the office, personal, and factory automation sectors. By year-end better than half its hardware business was 32 bit, and commercial sales had risen from less than 10% of total revenues three years ago to parity with its technical and scientific business.

Net sales soared 41% to $1.23 billion and net income leaped 150% to $75 million—not counting an extra $3.4 million from an extraordinary gain. The company's net operating margin climbed to 8.8%, higher than its archrival DEC.

Like DEC, DG's numbers were boosted by a very strong overseas performance—particularly in Europe. Late in 1983, Data General's overseas business was growing at only 4%. By the end of the company's fiscal year (September 1984), international sales were growing at 46.2%, compared to the U.S. mark of 42.9%, and this pattern continued through year-end. Early in 1984, Data General named Hisashi Tomino, president of its Japanese subsidiary, to the post of corporate vp. Apparently, he was the first Japan-based Japanese national to be an officer of a U.S. dp company.

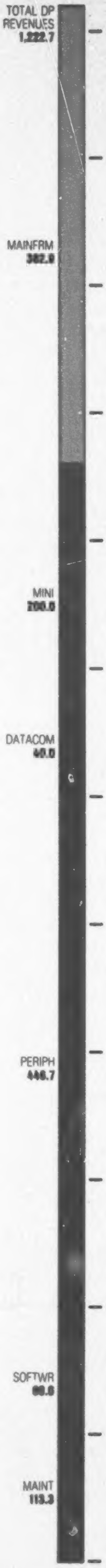
DG's market-leading office automation suite, CEO, is now available in all major foreign lanaguages, and there are signs that Germany, France, the U.K., and Japan may be beginning to move forward with major office automation contracts, offering a possible bounty this year.

Product announcements weren't heavy in 1984, and mostly focused on the low end, LANs, and communications. A notable first was the Data General/One, the world's first 25-line LCD portable pc, which began shipping late in the year.

Also announced was a modified MV 4000 (the 400/SC and DC), an entry-level departmental processor; a slew of networking products with an IBM-compatible bias; new engineering workstations; and a new native mode Unix slanted toward workstations.

DG notched up its first microcomputer revenues, some $100 million in all, from its new Desktop Generation models, and its field service revenues grew a blistering 75% to $289.7 million. Founder and ceo Edson de Castro intimated last year that in 15 years only 25% of the company's revenues would come from hardware; the rest would come from software and services.

Revenue figures are in millions of dollars. Each increment represents $100 million.



20

ICL

Putney Bridge, Fulham
London SW6 3JX, England
(44-1) 788-7272

Once again it's been all change at ICL, the U.K. mainframer. In has come Sir Kenneth Corfield, whose telecom company Standard Telephones & Cables (STC) snapped up ICL for a cool $540 million in August last year. Out has gone Sir Michael Edwardes, after only a few months with the company as chairman.

There's been some change in ICL's financial fortunes too, with revenues up 8% in local currency to £917 million, or $1.22 billion. The STC takeover of ICL has created a $2.6 billion company. STC is strong in telephone transmission, undersea cable laying, and electronic components, with around half its sales coming from British Telecom, the local PTT. ICL, meanwhile, is one of Europe's oldest indigenous mainframe manufacturers. Together, the two firms hope to take advantage of the computer/communications convergence.

So far, the companies have kept their separate identities. The only concession to the new union has been the transfer to ICL of STC's Business Systems Group, which sells PBXs. But the two sides have begun thrashing out plans for a single intergrated product line, with two of the likely areas being flat screen liquid crystal displays and private networks.

In the meantime, STC is feeling the strain of a two-year acquisition and product development program. (Nearly three quarters of its products have been introduced within the last three years.)

One piece of ICL product development long awaited in Britain is the company's DM1 mainframe, developed with Fujitsu of Japan. The much-delayed machine was finally launched in late April this year.

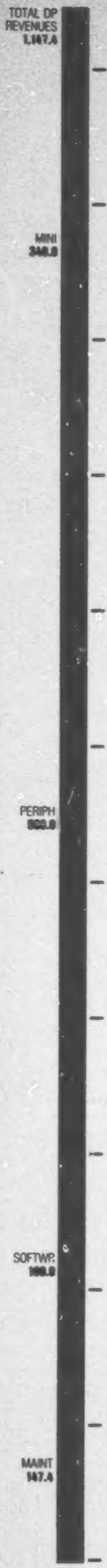
ICL has already revamped its VME mainframe operating system to cater to the DM1 and a second more powerful machine called the Estriel. The VME's new look focuses on local area networking and facilities for CAFS, ICL's fast disk search add-on that is now seen as a key selling point for ICL mainframes.

At the small end of the scale, the One-Per-Desk (OPD), a combined terminal, pc, and handset, debuted late last year. Here, the tie-up with STC already seems to have paid off, since STC's old friend British Telecom is a big customer for the system.

ICL has also made personnel changes. Robb Wilmot has been replaced as managing director by marketing man Peter Bonfield. Wilmot himself, now chairman, works part-time for the company. Some view the STC takeover as a testimony to Wilmot's success in rebuilding ICL since the start of the decade.

But the real test of the company has yet to come. Overseas business was flat in 1984. Like most European manufacturers, ICL has been unable or unwilling to capitalize on the dollar rate by upping U.S. exports. What's more, the DM1 and Estriel machines are crucial to ICL's future. IBM U.K. has been chasing ICL customers hard, and if the U.K. company starts to lose its 2900 series mainframe base in the transition to the new systems, Sir Kenneth will wish he hadn't gone shopping in 1984.

Revenue figures are in millions of dollars. Each increment represents $100 million.



21

NIXDORF COMPUTER AG

Furstenallee 7
4790 Paderborn, West Germany
(49) 52 51 3000

Heinz Nixdorf, the autocratic founder and chairman of Nixdorf Computer, finally decided to loosen his financial grip on the fast-growing German firm. For the first time in its 33-year history the company made a public offer of 20% of its stock on the German exchanges. Not suprisingly, the shares were snapped up by investors who have watched the company grow like Topsy over the last few years. Those same investors were even more enthusiastic when Nixdorf announced its 1984 results. Revenues totaled roughly $1.15 billion (DM3.3 billion), a 21% increase in local currency. The order backlog was up 21% and income was strong enough to keep even the most cynical investor happy.

What impresses these hard-nosed money men the most is the fact that Nixdorf has been able to earn a name for itself outside its home market. Last year German revenues rose 22%, compared to an equally impressive 19% gain in foreign markets. These export sales now account for 50% of the company's annual take.

The European markets still provide the bulk of its export business. But business is getting better in the States for Nixdorf, one of the few European companies that's really been successful in America. Nixdorf's U.S. subsidiary, which made its first profit back in 1982, now provides over 10% of sales. The German company is also building up its operations in South America and Asia. That global spread makes Nixdorf one of Europe's most international dp firms.

Nixdorf broke new ground on the product front in 1984. At the Hannover Fair, the company announced two new families of multistation systems, the 88BK office range and the 8832 fault-tolerant minis built by Auragen Systems in the U.S. It also expanded its 8870, 8890, and 8860 minis.

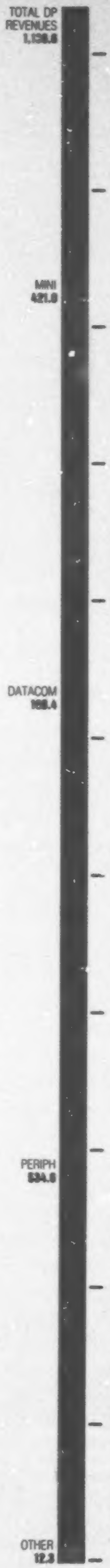
Unix will probably be supported on many of these ranges in the next year or so. Nixdorf, which feels the AT&T operating system is the key to future software development, now has more than 200 people using Unix at R&D centers in the U.S., Holland, and Germany. It also became part of the European Unix group earlier this year.

During 1984, the company continued to develop expert systems software and came up with a new software tool called TWAICE, an acronym for the modestly-named True Wisdom, Artificial Intelligence and Computerized Expertise product. TWAICE is designed for work in complex technical fields.

Much of the company's product concentration is now in communications. Over 200 Nixdorf 8818 digital PBXs have been sold since 1981. The firm is also involved in helping the German PTT set up the Bigfon digital network. It also unveiled the Digifon intelligent digital telephone handset last year.

Product development costs money, and the company upped R&D spending by around 20% to $122 million last year. All the signs say that money will be well spent by a company that's making its presence felt in the dp world.

Revenue figures are in millions of dollars. Each increment represents $100 million.



22

TOSHIBA CORP.

1-1 Shibaura 1-Chome
Minato-ku
Tokyo 105, Japan
(81-3) 457-2105

Toshiba pulled out of a cyclical slump in 1984. After two years in the doldrums, the energy and electronics conglomerate bounced back with a 22% increase in revenues to $13.89 billion (Y3.3 trillion). Despite efforts to increase its relative share, dp revenue remained below 8% of total sales. Nevertheless, Toshiba's corporate commitment to dp remains strong. When the Toshiba staff moved into the new 40-floor corporate headquarters in central Tokyo in early 1984, they plugged into one of Japan's most advanced local area networks. Toshiba calls its approach "hierarchical office automation." That's nothing new. But a corporation actually attemping to create a paperless office environment is news in the conservative Japanese business world.

Toshiba's 1984 products reflected the company's determination on both the OA and telecom fronts. Taking advantage of the AT&T divestiture, Toshiba sold 1,000 digital PBXs in the U.S. last year. The firm's OA efforts are based on its strength in CMOS circuits. Toshiba, which produced samples of a CMOS implementation of Microsoft Corp.'s MSX micro software standard in 1984, still lacks a 32-bit chip required for the next generation of office equipment.

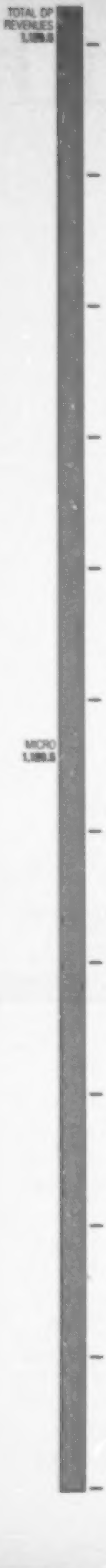
At the high end, Toshiba still doesn't have a mainframe in its product portfolio. Consequently, it is vulnerable to cannibalization of its existing user base by full-service houses in Japan like NEC and Fujitsu. Back in 1971 Toshiba joined forces with NEC to produce the ACOS mainframe series. While Toshiba formally ended the alliance in 1976, it has remained dependent on NEC mainframes and software. Such dependency creates a need for an alternative. One alternative is Unix. Last year, Toshiba moved closer to adopting Unix as a cohesive approach to office and factory dp.

During 1984 Toshiba looked for a way to bolster its limp line of microcomputers. Its solution was to court local micro maker Sord Computer, which was struggling for survival. Toshiba swallowed Sord in early 1985 by purchasing all outstanding shares of the privately held company.

Two other courtships made 1984 an interesting year. IBM Japan and Toshiba considered collaborating on large-scale systems aimed at connecting factory automation systems with IBM mainframes in the office. Despite widespread rumors, the union was never consummated in 1984. Toshiba's other tie-up talks, with AT&T International in Japan, may have seemed like a potential conflict to IBM. That didn't stop IBM, however, from asking Toshiba to oem 1 million 3.5-inch floppy disk drives.

Toshiba wants to market and eventually produce AT&T's No. 5 ESS switch for use in value-added and local area networks. Toshiba also had its eye on AT&T minis and PBXs. AT&T, which has other deals in the works with Ricoh and Olivetti Japan, could find itself offering conflicting product lines through Toshiba.

Revenue figures are in millions of dollars. Each increment represents $100 million.



23

COMMODORE INTERNATIONAL LTD.

1200 Wilson Drove.
West Chester, PA 19380
215-431-9100

It's not the best business strategy to kill the goose that has laid the golden eggs. Commodore International's chairman, Irving Gould, should have brushed up on his fairy tales before forcing out Jack Tramiel. Tramiel was the founder and guiding light behind Commodore's spectacular rise from sales of about $125 million in 1980 to over $1 billion by 1983.

Tramiel was no saint in his stint as president and ceo. He ruled Commodore in an autocratic fashion, hiring and firing at whim: he's said to have once hired, fired, and then rehired four top executives in a short period of time.

Employees admitted they were scared to death of Tramiel, who nevertheless got the job done. But in early 1984 chairman Gould decided Tramiel should be replaced by a more managerially oriented businessman. In spite of Tramiel's reputation, a flock of Commodore executives exited with him. After a few months and much fanfare Tramiel bought Warner's Atari unit. He has plans to market a new low-priced entry into the pc field by mid-1985. His timing may be off, however.

The mass exodus hit Commodore just as the market for low-priced pcs began to show signs of waning. Consumers were being tempted with higher priced models from IBM and Apple, which offer graphics and more software. By year-end 1984, the damage was done. Commodore's net income for the quarter dropped 94% to $3.2 million, while sales slipped 21% to $338.7 million.

These figures affected calendar 1984 numbers, where total revenues increased a mere 14% to $1.13 billion and earnings fell 20% to $100.3 million. The decline in the last quarter of 1984 didn't bode well for Commodore, which has made its reputation as a mass marketer of low-priced computers, and for which the Christmas buying season is deemed the most important. Upon release of the quarterly report, security analysts predicted the company would have to make some rapid changes.

By February 1985, Commodore had reacted, cutting prices on its Commodore 64 about 24%. These cuts left Wall Street analysts unimpressed. They point out that inventory on Dec. 31 was about $450 million, which must be sold before the company can introduce its new Commodore 128. The introduction has been postponed.

Two products introduced during 1984 were off to less than wonderful starts. The Plus/4 and the Commodore 16 were reportedly not meeting sales projections, and speculation was that the company would abandon U.S. sales of these products while continuing foreign sales.

Commodore is obviously in need of strong management decisions, and its new president, Marshall F. Smith, doesn't have a computer background. He does have a contract for $2.4 million for his first 28 months as president and ceo, so whether he lays a golden egg or just an egg, he'll be richer and wiser.

Revenue figures are in millions of dollars. Each increment represents $100 million.

24

L.M. ERICSSON

S-126 25
Stockholm, Sweden
(46-8) 80200

Ericsson Information Systems (EIS) can best be described as a huge development project. Set up by parent LM Ericsson only four years ago through a series of mergers and acquisitions, the Swedish company's revenues reached roughly $1.12 billion (Skr9.29 billion) in 1984, a 25% increase in local currency.

Still in the startup phase, EIS's numerous development projects have taken a toll on the division's profitability. EIS reported a loss of $26 million in 1984, compared to a profit of $31 million in 1983.

Although growth wasn't as good as the company had expected, its products continued to do well. The EIS MD 110 PBX, for example, is now installed in 12 countries, including the U.S. Roughly 28% of EIS's revenues are earned in its home market in Sweden. The rest of Europe pulls in about 62%, while the U.S. chips in less than 10%.

The company is having a tough time in the States, where its Ericsson Inc. subsidiary has racked up a large deficit. U.S. sales have been depressingly slow, with the exception of the MD 110 switch. Its much publicized ergonomics image, which helped it score sales in Europe, hasn't helped the company much in the American arena. In the U.S., for example, Ericsson's new, IBM-compatible pc is called the Ergo-Intelligent Personal Computer, but despite its ease of use—and a touring rock music road show about ergonomics—sales in America have remained slow.

On a brighter note, the company's Alfaskop line of IBM 3270-compatible vdts continues to be a strong seller in Europe. Alfaskop terminals are actually the company's major revenue earners. EIS claims to be in second place behind IBM in vdt shipments in Europe, and to have 15% of the world vdt market. Taken by surprise by IBM's early 1984 announcement of cheap new 3270 models, EIS responded by dropping some of its prices.

During 1983 EIS took over Swedish office equipment manufacturer Facit. This side of the business continued to do well in 1984, although the company still hasn't come up with wares to compete with some of IBM's new office products. This could be a drawback for EIS in 1985.

Another lingering drawback is the firm's deficiency on the minicomputer front. Its only major product in this area, the Series 2000, functions as a controller of bank terminals and peripherals and as a freestanding computer for on-line applications. In the micro realm, EIS became an oem customer of California's Sun Microsystems last year.

EIS's other main weakness is not on the product side, but on the management side. Part of the giant LM Ericsson group, EIS is subject to the same conservative management philosophy that permeates its parent, which stymies the division's ability to make swift responses to market changes.

To sharpen the division's management edge, Rolf Ericsson was replaced in the EIS top spot by Stig Larsson, known to be a hard-nosed executive.

Revenue figures are in millions of dollars. Each increment represents $100 million.

Revenue figures are in millions of dollars. Each increment represents $100 million.

25

TRW INC.

23555 Euclid Ave.
Cleveland, OH 44117
(216) 383-2121

Even a $6 billion-plus conglomerate like TRW Inc. likes to measure itself against IBM when it's talking data processing.

In its 1984 annual report the company says software developers at its Defense Systems Group "wrote about 10 million lines of software code in 1984, an amount second only to IBM."

Writing software was good business for TRW in 1984, generating $825 million in revenues, up from $760 million in 1983. Overall dp revenues reached $1.11 billion (up from $1.02 billion). Dp revenues accounted for 18% of TRW's 1984 total revenues of $6.06 billion, up from 1983's $5.49 billion.

The Electronics & Space Systems segment was by far the biggest of TRW's three operations. All of TRW's dp revenues are earned in this division. E&SS's 1984 revenues were $2.9 billion or 48% of the grand total.

Within E&SS, TRW credits its consumer and business credit reporting services with being the fastest growing operations. These use a database on more than 90 million consumers and 8 million businesses to earn $100 million in revenues in 1984, up from $90 million in '83.

During 1984, the company merged these operations with its broadly based financial and real estate information service to create a new operating unit, the Information Systems Group. Headquartered in Los Angeles, the operation has stated its intention to "vault into other attractive information systems markets."

Maintenance and repair of computers and related products continued to be a good business for TRW in '84, accounting for revenues of $180 million, up from $165 million a year earlier.

Space and defense continue to be the forte of the company. (It boasts of its role in putting a man on the moon.) Under terms of the largest government contract it has ever received, with a projected value of $1 billion, TRW is developing the communications payload for the MILSTAR program. It is continuing as a major provider of systems engineering, software, and information processing services for major space and defense programs, including producing software for artificial intelligence projects.

As part of the Federal Aviation Agency's effort to update and improve the Air Traffic Control system, TRW is working on a system to install existing software in new computers for the country's Air Traffic Control Centers.

TRW has long been successful in parlaying its government work into lucrative commercial business, and now it's attempting the same move with local area network technology. It has created an Information Network Division to exploit technology developed during its work on broadband-based turnkey government systems. It already has installed large scale networks for a major Midwest health care center and for the corporate headquarters of a Fortune 100 company.

Revenue figures are in millions of dollars. Each increment represents $100 million.

26

N.V. PHILIPS GLOEILAMPENFABRIEKEN

P.O. Box 32, 1200 JD
Hilversum, The Netherlands
(31-1) 237-0070

After years of running hot and cold about the computer business, the Dutch electronics giant Philips began to look like it was serious about dp last year.

It boosted its minicomputer line, made a determined effort to strengthen its pc range, and further defined its flagship networking strategy. On the organizational side, the company revamped its North American subsidiary and made preparations for merging its data systems and private communications divisions this year.

Dp revenues also looked stronger in 1984, up 12% in Dutch guilders to G3.5 billion ($1.09 billion), and the company is hoping to improve that growth rate significantly. Around 20% of those revenues came from the U.S., but the Philips Information Systems (PIS) subsidiary was finding the market tough and profitability fell drastically. The Dutch parent stepped in and merged the U.S. division with its Canadian office products company, Micom, shedding 55 employees at the PIS head office in Dallas.

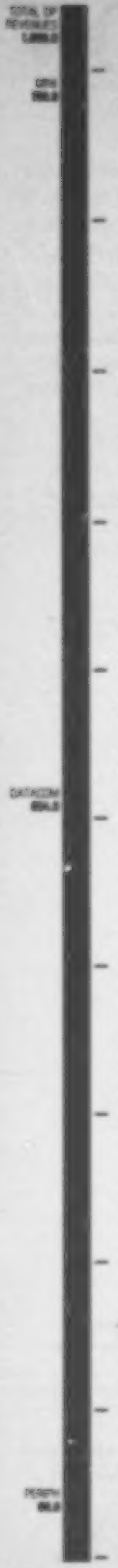
Back in Europe, the company joined forces on memory components with Germany's Siemens, another local electronics giant that has recently undergone reorganization of its dp division. With the backing of the Dutch and German governments the two companies have set up the "Megaproject" to develop 1MB RAMs by 1986, and a 4MB RAM by the end of the decade.

Two of Philips' other joint ventures made headway. Its linkup with Control Data Corp. to make optical storage devices resulted in the formation of a new joint company, Optical Storage International in Santa Clara. The first product, LazerDrive—a 1GB, 12-inch exchangeable optical disk drive—was also launched. Philips' joint company in Holland with AT&T, which produces public telephone switches and transmission equipment, also won its first international contracts in Colombia.

On the product front, Philips doubled the power range of its P4000 minicomputer series and added a whole suite of new office-based packages. Philips' pc line also saw new introductions including the P3800 multitasking micro and the P3100, an IBM PC-compatible machine that's sold under license from Corona Data Systems. Philips also gave its support to the European Group for Open Systems Interconnection (OSI) standards and, earlier this year, the European Unix group.

More significant for the future, the company enhanced its all-encompassing networking concept, Sophomation (Synergistic Open Philips Office Automation). The company hopes to use Sophomation products to build its dp future.

Sophomation has already attracted interest from large users on both sides of the Atlantic, but so far has not generated significant revenues for the company. The situation may change since Philips has begun this year to plug some of the gaps in the strategy, introducing the Sopho-Switch digital PBX.



27

NORTHERN TELECOM LTD.

33 City Centre Dr.
Mississauga, Ont. L5B 3A2
(416) 275-0960

Northern Telecom continued to confound the industry, making AT&T work hard for its money again in 1984: the successful Canadian-based company is hot on AT&T's heels in the telecommunications equipment market, enjoying brisk growth in the markets for both PBXs and central office switches. In fact, Northern apparently outsold AT&T in the U.S. PBX market and ate AT&T's lunch in the central office switch business. The company's top line reflected this improvement, as corporate revenues for 1984 expanded 28% to $3.33 billion. The bottom line, however, did not keep up, as net income inched forward but 6%, to $241 million.

Northern's business is heavily concentrated in North America. Domestic revenues represent almost 30% of the Canadian firm's total business, but its biggest market is still the U.S. Revenues from the U.S. climbed 50% to $2.8 billion. Early with an all-digital approach to telecommunications—with equipment for both onsite and central office switching—the company captured a sizable portion of the U.S. market for switches bought by the regional Bell holding companies, grabbing the business while AT&T was busy dealing with the aftermath of its breakup. Sales of the company's DMS line of central office switches, which account for nearly half of total revenues, rose 55% in 1984, to $1.6 billion. Meanwhile, revenues for the SL family of digital PBXs surged 38% to $864 million from $627 million in 1983.

Unlike its chief competitors, AT&T and Rolm, Northern Telecom has only a limited line of dp products to complement its PBXs in customer installations. Its line of terminals holds less than 1% of the American market and constitutes only a small part of total revenues. Its most noted terminal product, the Displayphone integrated voice and display terminal, suffered through another lackluster year, as Northern sold about 50,000 units. That was enough to hold on to its 35% market share, but not nearly enough to make up for all the ground it lost since creating the market several years ago.

With its dp products unable to generate big profits and the market for its currently lucrative switching equipment expected to dry up by 1986, Northern has had to turn to other potential revenue sources. In February 1985, it made its latest pitch for the office automation market.

Undaunted by its past OA failures—including $100 million losses by the Integrated Office Systems division—Northern introduced the Meridian DV-1, an integrated voice and data system compatible with Northern's PBXs. While the company denies much product overlap, some industry analysts believed that the DV-1 was not much more than a Displayphone in new clothing. In addition, Northern brought out its Meridian PBX, designed to replace the aging SL family. To bring these products to market, Northern boosted R&D funding to $328 million from $247 million in 1983.

Revenue figures are in millions of dollars. Each increment represents $100 million.

28

MCDONNELL DOUGLAS CORP.

P.O. Box 516
St. Louis, MO 63166
(314) 232-0232

McDonnell Douglas Corp. spent most of 1984 reorganizing, restructuring, and renaming components of its one-year-old Information Systems Group. It is hoping to grow the ISG from just under a billion dollars today to $4 billion in revenues and $400 million in pretax profits by 1990.

Part of the reorganization involved spinning off the company's internal computing activities from the commercial external computing business. This was done to avoid conflicts that might arise from its dealings with the federal government and to make the commercial side of the house more competitive.

Total worldwide dp revenues for 1984 (from external sources) was $982.8 million, most of it from the United States. The sum marked a 25.7% increase over last year. Corporate profits were up $50 million in 1984 to $325.3 million on total revenues of $9.66 billion.

Corporate president John McDonnell envisions the Information Systems Group becoming the equal third leg of a stool held up by combat aircraft, commercial transport, and information systems. Right now, the ISG leg is on the short side, considering it contributes less than $1 billion in revenue to a $9 billion company.

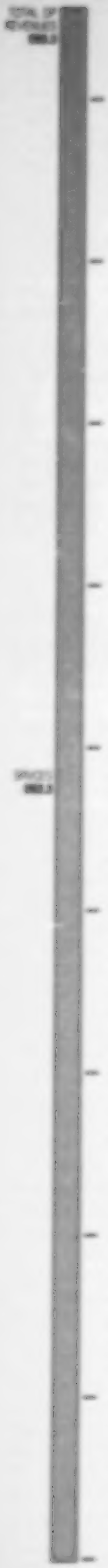
Last year also witnessed a further integration of the various entities that comprise the ISG. Changes included renaming some of the acquired ISG entities. Most components of the ISG will include the McDonnell Douglas name in them. For example, Microdata, an MDC subsidiary that manufactures minicomputer systems, became McDonnell Douglas Computer Systems Co. The Tymshare name was dropped altogether in favor of McDonnell Douglas Network Systems Co., even though Tymnet was retained as a product name.

The ISG also includes the Computer Technology Group, McDonnell Douglas Health Systems, McAuto, Information Network Services Group, Financial and International Group, Finance and Administration Group, and the National Computer Operations Group. McDonnell Douglas Network Systems Co. had 1984 revenues of $109.2 million. CAD/CAM/CAE accounted for $102.2 million, and the rest of the data processing revenues came from computer services.

As the remote computing industry matures, part of the ISG strategy has been to acquire companies in areas where it was lacking strength. Ultimately, ISG wants to consolidate all its divisions into five or six groups covering vertical markets that can offer solutions to targeted industries.

Sounds good in theory. And, if all goes according to MDC's lofty plans, each year the ISG will contribute an ever larger percentage of corporate revenues. But with the stiff competition coming from many of the vertical markets the company competes in, it looks as if McDonnell Douglas will continue to rely on its combat aircraft and aerospace divisions to fill its coffers for many years to come.

Revenue figures are in millions of dollars. Each increment represents $100 million.



29

AUTOMATIC DATA PROCESSING INC.

One ADP Boulevard
Roseland, NJ 07068
(201) 994-5000

While it hasn't shied away from new ventures, Automatic Data Processing Inc. can thank its time-tested payroll and accounting service offerings for its enviable record of continuing financial growth. The 36-year-old company's revenues have grown more than 10% in every year since it went public in 1961. In calendar 1984, its revenues were $958.3 million, up 17.4% from 1983's $816.5 million, and payroll and accounting contributed more than half of this.

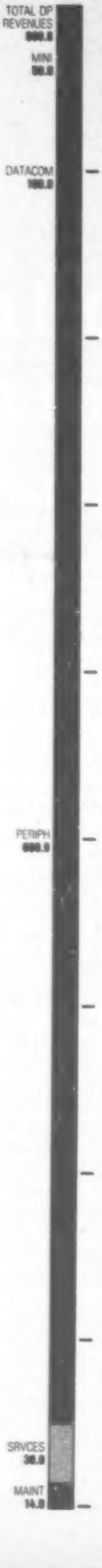
Commenting on the quarter ended Dec. 31, in which revenues were $253.6 million, up from $218.5 million a year earlier, president and chief executive officer Josh S. Weston says, "Stronger than anticipated new account revenue growth in Employer Services [accounting and payroll] offset continuing low trading in brokerage services." Earnings per share in fiscal '84 were up 15% to $2.14 over fiscal '83's $1.86. Analysts say that ADP is likely to continue its healthy growth rates in the coming year. Late this winter, for example, Goldman Sachs predicted an 18% growth in ADP's net income for 1985.

Over the years, the company has added to its basic services and introduced other service products, often through acquisition. Today it provides brokerage back-office processing, stock quotations, timesharing, automobile collision estimating, and electronic funds transfer products among others. For example, in the past couple of years, ADP has acquired payroll and accounting services from Computer Sciences Corp. and the Security Pacific Bank. And, aiming at a nationwide automatic teller machine network, the company expanded into Illinois and New England by buying two ATM companies.

In the mid-1970s, trying to ward off the threat from decreasing costs in on-site processing, ADP began offering hardware to its customers. It sold what it called its OnSite service based on Digital Equipment Corp.'s DECsystem-2020 machines. Users could install the machines at their offices and tie them into the ADP network for downloading of data, remote maintenance and support, and for backup when extra processing was needed. Now ADP offers IBM PCs as well.

Although its brokerage services business was slow in 1984, the company sees itself as being in the forefront in this field. In February, it formally launched a service to allow users to access such research services as Value Line and quarterly reports of more than 4,000 publicly held companies. In late '84, its TrendSetter system, which uses Convergent Technologies' desktop computers to receive satellite broadcasts of market prices and news, was in use at 200 banks, brokerages, and other companies in the U.S. and Europe. While Quotron currently dominates the market providing stock trading data, ADP feels it has a one-year lead over the newest competitors to announce an entry, IBM and Merrill Lynch & Co., which plan to begin service with their International MarketNet (IMNET) at the end of this year.

Revenue figures are in millions of dollars. Each increment represents $100 million.



30

OKI ELECTRIC INDUSTRY CO. LTD.

1-7-12, Toranomon
Tokyo, 105 Japan
(81-3) 580-8950

The prince of Japanese peripheral makers posted steady growth in 1984. But future profitability appears more unpredictable than ever because Oki Electric's markets in the office automation and telecom areas are hotly contested.

DATAMATION estimates that Oki posted net profits of $42 million (Y10 billion) in 1984. A good portion of those profits came from U.S. telecommunications sales. An estimated one third of Oki's 1984 sales came from overseas, up almost 40% from the same period in 1983.

Oki clinched an oem contract with 3M Corp. for facsimile machines in spite of stiff competition from close to 25 other Japanese firms as well as Xerox and Exxon in the U.S. Oki is in a fast-paced industry where aggressive price-cutting soon erodes profit margins. Consequently, Oki focuses on a fast product cycle in order to introduce a new model every six months, which can then be sold at a premium. Last year, R&D spending was up 25% to about Y18.5 billion.

The opening of Nippon Telephone and Telegraph Public Corp.'s (NTT's) fiber-optic trunk line connecting Tokyo and Osaka in autumn 1984 improved Oki's domestic sales. Japan's emerging value-added network market—like so many other Japanese markets, both high and low tech—appears to give preference to the family of traditional NTT suppliers: Oki, NEC, Fujitsu, and Hitachi.

Printer sales reached $336 million in 1984 even with an unstable personal computer market. Oki reached an agreement with the Chinese government to produce high-speed fascimile machines in China.

Demand for mobile phones surged in 1984. As a designated supplier for both NTT and AT&T, Oki had an inside track with both Japanese and American cities installing cellular radio systems. Last year also saw the establishment of sales support offices in Europe and Southeast Asia.

Oki also did well with intelligent terminals, which have been popular with domestic banks. In 1984, Oki Electric prepared on-line systems for the Fuji, Taiyo, Kobe, Hokkaido, and Takushoku banks.

Oki Univac Kaisha Ltd., subsidiary of Oki Electric, made plans to produce Sperry's medium-sized Chapparal computer for the U.S. market. The Ministry of Trade and International Industry signed both Oki Electric and Mitsubishi Electric to participate in the manufacture of the Personal Sequential Inference machine for the so-called fifth generation computer project.

Worries about U.S. protectionism prompted Oki Electric to establish overseas manufacturing facilities and sales networks. The merger of five U.S. subsidiaries led to the 1984 creation of Oki America Inc., with a PBX manufacturing facility in Norcross, Ga., which contributed to increased American sales of digital PBXs.

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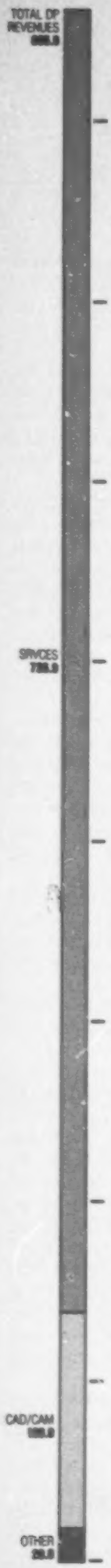


31

GENERAL ELECTRIC CO.

3135 Easton Turnpike
Fairfield, CT 06431
(203) 852-8200

Last year GE bounced back from a mediocre 1983. The company's earnings increased 13%, from $2.02 billion to $2.28 billion. Sales rose a more modest 4%, from $26.80 billion to $27.95 billion. GE, however, was quick to caution that those sales had to be adjusted to reflect the disposition of Utah International, its massive mining operation, and its houseware business. Casting those two adrift, sales were up 10% for the year. Analysts credited increased consumer sales and improved high-tech business for the positive statistics.

If the GE Information Services Co. (GEISCO) balance sheet is any indication, then high tech was where it was at for GE customers. After a downer in 1983, when revenues fell 8.5% to $600 million, GEISCO did an impressive about-face. Revenues leaped 20% to $725 million, easily the company's best year.

GEISCO used to be the last word in remote computing services (RCS). Now it wants to be the first word in enhanced telecommunications services. The company announced this metamorphosis at New York's Tavern on the Green, so you know it wasn't kidding around.

While not complete, the transition is going very smoothly. Already the operator of the world's largest commercially available teleprocessing network, GEISCO sought further leverage by entering the tenant services business. It hooked up with MCI, Wang, and InteCom. MCI will provide the long distance service, Wang will offer its office information processing systems, and InteCom will provide its third-generation, integrated voice and data PBX. GEISCO will be the single-source provider and integrator of all these services for tenants in office buildings.

Other new products included PC Mailbox, Quick Com for the IBM PC, QUIKLOAD, and a condensed computer version of *USA Today*. And Marknet, GE's internal telecommuncations system since 1968, finally went public.

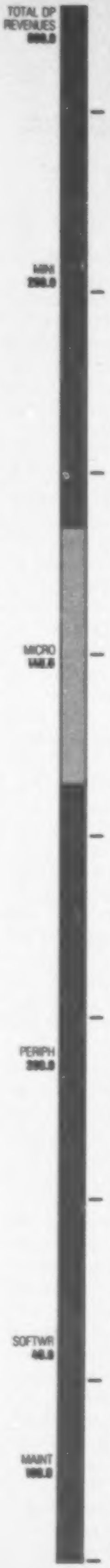
But these moves paled beside the January '85 announcement that GEISCO and Apple would get it on with an enhanced telecommunications service called AppleLink. Hard on AppleLink's heels was DealerTalk. It will use the Macintosh as an intelligent workstation linked to GE's worldwide telecom network.

Despite its desire to become an enhanced telecommunications company, GEISCO isn't giving up the remote computer services business.

Judging from the revenue increase, the enhanced telecommunications act is playing in Peoria and everywhere else. And according to Robert McCalley, general manager of the enhanced telecommunications products division, there are more rave reviews to come.

"We had no lowlites in '84," he says. "It was an extremely positive year by any measure, and '85 looks even better."

Revenue figures are in millions of dollars. Each increment represents $100 million.



32

TEXAS INSTRUMENTS INC.

P.O. Box 225474
Dallas, TX 75265
(214) 995-3773

Despite the worldwide semiconductor slump, lackluster minicomputer sales, and a 16.6% decline in fourth quarter profits, 1984 was a record year for Texas Instruments in net sales billed and earnings per share.

TI blamed the decline in fourth quarter earnings on the cost of increased data systems inventories and the effect of the strong dollar, which depressed the company's foreign results. Profits were also crimped by weakness in the semiconductor industry, which led TI to execute a previously reported plan to lay off off about 2,000 workers. TI has also had a run-in with the government over what the feds call inadequate semiconductor testing: the Pentagon says it has had problems with some of TI's microcircuits.

Corporate revenues were $5.74 billion, up 25% over 1983. Net income for 1984 was $316 million, compared with the company's 1983 net loss of $145.4 million. Earnings per share in 1984 were $13.05, including a gain of 95 cents per share arising from third-party sales of previously written-off consumer products. TI had a net loss of $6.09 per share in 1983 due mainly to its departure from the home computer business.

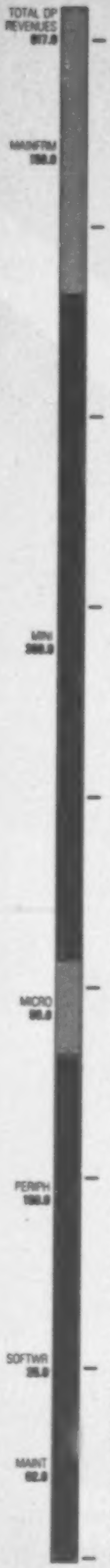
Worldwide data processing revenues were up 7.5% in 1984 to $860 million from $800 million. DATAMATION estimates that minicomputer sales were flat at $290 million. But microcomputer sales were up 16% to $140 million. Peripherals sales increased to $290 million in 1984 from $270 million in 1983. Maintenance and repair accounted for $100 million in 1984 compared with $90 million in 1983.

TI has been actively marketing its Professional Computer, which has gained some acceptance even though it is not 100% IBM PC-compatible. To address the issue of compatibility, TI has introduced a multiuser microcomputer that will run PC AT software.

Among its product introductions was the Explorer, designed for artificial intelligence software development. While much of TI's talk about AI could be seen as a marketing ploy, the company says it is serious about AI research and that it has real products to show for it, including Personal Consultant software, said to provide artificial intelligence capability on the TI Professional Computer, and a number of software offerings that feature a natural language interface. Initially, the bulk of the software was available only on the TI Professional Computer. Now, the vendor is making more of the software available for IBM PCs and compatibles. The company's software revenues were up 33% to $40 million.

Despite IBM's commanding lead in the pc arena, TI is still searching for ways to attract user attention. As one strategy, it has chosen to put big development dollars into voice recognition technology, hoping to buy some competitive differential. But even if companies ante up for this technology faster than some studies indicate is likely, TI still faces tough times in its bread-and-butter business—semiconductors.

Revenue figures are in millions of dollars. Each increment represents $100 million.



33

MITSUBISHI ELECTRIC CORP.

2-2-3, Marunouchi
Chiydoda-ku, Tokyo 100, Japan
(81-3) 218-2171

Mitsubishi Electric made encouraging gains in the microcomputer oem business during 1984. DATAMATION estimates that personal computer shipments to Sperry Corp. and Leading Edge were at least twice 1983 levels. This helped push data processing revenues up to $817 million (Y194 billion). With a downturn in semiconductor demand, Mitsubishi Electric looked to the embryonic Japanese telecommunications market for sustained growth and diversification in 1984.

A joint venture between Mitsubishi Corp. (an affiliate of Mitsubishi Electric), local software house Cosmo 80, and IBM Japan Ltd. finally crystallized in late 1984. The resulting company, called Advanced Systems Technology Inc., will use software developed by IBM to offer several value-added network services in the Japanese telecommunications market. Mitsubishi Electric itself teamed up with the Communications Satellite Corp. to jointly bid on a Federal Express Corp. contract for satellite dishes. The growing Japanese telecommunications market demand for network multiplexors also attracted Mitsubishi Electric in 1984.

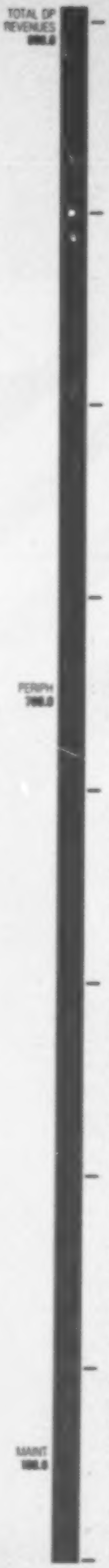
Japan's Institute for New Generation Computer Technology (ICOT) asked the company to manufacture the TTL-dedicated Prolog machine that was developed during the first phase of the fifth generation computer project. If commercial requests for the machine materialize, Mitsubishi Electric is the likely system supplier. These orders would be handled by the project's sponsor, the Ministry of International Trade and Industry (MITI). The company has, in fact, been a key participant in ICOT from the beginning. Like other Japanese semiconductor manufacturers, Mitsubishi Electric is assumed to be developing software tools to automate the VLSI design process. Its affiliated Mitsubishi Research Institute was also reported to be working on commercial artificial intelligence applications during 1984.

Sales of the Melcom small mainframes slumped last year. The 32-bit superminicomputer Melcom 70 MX-3000, however, was an intriguing Unix offering. The company claims the system combines both Unix and real-time applications for control systems. System deliveries, which started in the last quarter of 1984, rapidly leveled off. NEC's competing real-time operating system for its supermini was much cheaper than the Melcom 70 MX-3000 system, which has a base price of $98,039 (Y25 million).

Part of Mitsubishi Electric's 1984 budget went into building a network of affiliated software houses. The company got into a software scandal the year before when it was implicated, along with Hitachi, for stealing IBM software secrets. It appears that profitability of the Computers and Systems division, however, was relatively unaffected.

At the low end, Mitsubishi Electric's MSX home computer showed steady sales in 1984. The company won several oem contracts to produce the MSX machine for European and American markets.

Revenue figures are in millions of dollars. Each increment represents $100 million.



34

STORAGE TECHNOLOGY CORP.

2270 S. 88th St.
Louisville, CO 80028
(303) 673-5151

Optimists will note that in 1984 StorageTek was neither sold nor liquidated. They will also hail the firm's new top management, ceo Ryal Poppa and president Stephen Jerritts. And they will certainly remind you that revenues kept pace with 1983 through three quarters, dipping only in the fourth.

Ah, but what a fourth quarter it was! StorageTek staged the biggest Halloween trick in computer industry history, filing for bankruptcy on that fateful day. Soon after, Poppa and Jerritts were hired. Some critics questioned their credentials even though two of their former employers, Pertec and Lee Data, had rebounded under their reins as users had hoped. What's more, StorageTek lost money and employees with equal dispatch—the money through a variety of outlets and the employees as a direct result of not having enough money to pay them.

When the smoke finally cleared, the numbers were shocking: in the final quarter, StorageTek lost $419.2 million on revenues of $151.9 million; the only mitigating factor was a $279.7 million writeoff of nonrecurring expenses. For the year, the firm lost $505.5 million on revenues of $808.6 million, compared to 1983's loss of $40.9 million on revenues of $886.6 million. Poppa noted, "Our loss should be regarded as putting the past behind us, and providing a base from which we can grow." He said the firm hopes to emerge from Chapter 11 in 1986.

Storage Technology's problems originated almost four years ago—when IBM introduced its 3380 high-end disk drive—and escalated through several late or canceled products, misread markets, technical problems, and powerful competition. By the end of 1982, the firm had begun its near-fatal nose dive.

Through much of 1983 and 1984, company executives kept promising that recovery was only a quarter or two away, but the news kept getting worse. In late 1983, the firm introduced its optical disk drive, but the expensive peripheral never generated the interest StorageTek expected. Then, in January 1984, the firm scuttled its long-delayed plug-compatible CMOS mainframe, running up huge write-offs in the process. Shareholders in the R&D partnership that had sponsored the project sued StorageTek, further compounding its woes.

By October, the firm's financial situation had grown so shaky that its major creditors worried whether they could ever get their money, and pressure from some of StorageTek's banks—particularly the Dresden Bank in Germany—forced the firm to file for protection under Chapter 11 of the federal bankruptcy code. President Naim Aweida left almost immediately, and soon thereafter founder and chief executive Jesse Aweida resigned. Layoffs escalated, the new management waffled on whether to drop the optical drive, and new financing arrangements were set up and then dropped.

The only sure cash the company could count on was from its maintenance contracts, which provided steady revenue throughout the year.

Revenue figures are in millions of dollars. Each increment represents $100 million.

35

GENERAL MOTORS CORP.

3044 General Motors Blvd.
Detroit, MI 48202
(313) 556-5000

So maybe it wasn't the largest acquisition in history. The Romans, after all, did take over a few pieces of land. But no dp industry takeover has ever been in the same universe as General Motors' $2.5 billion acquisition last October of Electronic Data Systems. And while GM may have swallowed EDS's corporate organization (although EDS retains its own identity), EDS has gulped down GM's entire dp operation.

Not that EDS was doing badly on its own, although 1984 wasn't quite up to the stringent standards established by founder and chairman H. Ross Perot. EDS reported revenues of $786.1 million, a 9% increase over 1983 but less than one third the increase of a year earlier. Net income also suffered, rising 5.5% to $71.2 million, a far cry from the 28% increase reported in 1983.

But none of that fazed GM, which paid more than 33 times earnings for EDS. GM chairman Roger Smith said EDS "is the one company in the world capable of successfully addressing GM system development needs." That's a tough job, but somebody's got to do it.

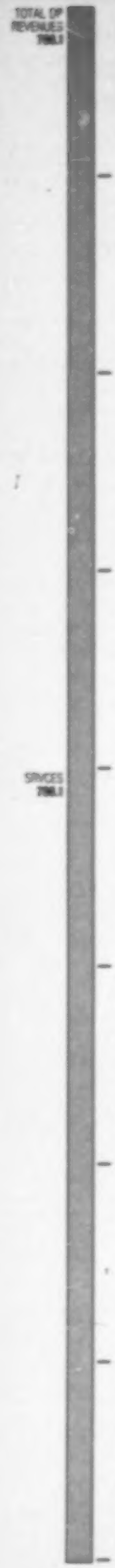
Even with the paramilitary, no-nonsense approach practiced by Perot, the rescue won't be easy, since GM's dp operation isn't exactly chopped liver. The automaker spends more than $6 billion annually on dp—about nine times EDS's total sales. GM has 27 data centers with 114 mainframes; EDS has five data centers with 17 mainframes.

But EDS has proven consistently that it can play with the big boys. Its mainstream business comes from the health care and credit union markets. At year-end EDS was serving 3,100 credit unions with 10 million members; 13 Blue Cross/Blue Shield organizations used EDS's facilities management and processing services. A quarter of its business comes from governments; in 1984, the company signed an eight-year, $350 million contract with the Navy to update its dp facilities, build a nationwide telecom network, and train more than 5,500 personnel.

Taking over GM's dp will further swell EDS's coffers. Some $1.5 billion to $2 billion in dp work is expected to be transferred to EDS this year. Add that to the $2.8 billion in confirmed orders that the company had at the end of 1983 and we're talking some mighty black ink here.

Yet even with all its business acumen, EDS may have a hard time with GM's major dp initiative. The Manufacturing Automation Protocol (MAP) is GM's bid to standardize the factory floor so that it no longer contains "islands of automation."

Because GM's word is law with many vendors who want to keep the company's business, a number of very large corporations have announced their support for MAP. But you can fit what EDS knows about factory automation on a microchip. The company will absorb MAP by osmosis as part of GM's transfer of 10,000 dp and computer workers to EDS. MAP wasn't built in a day, and it may take a while for EDS to learn its way.



Revenue figures are in millions of dollars. Each increment represents $100 million.

36

AMDAHL CORP.

1250 E. Arques Ave.
Sunnyvale, CA 94086
(408) 746-8510

For Amdahl, 1984 was a year of transition, as the leading American pcm redirected its market focus and entered potentially lucrative new sectors of the industry. As is often the case with transition years, however, the firm's financial performance was unimpressive—particularly when compared to Amdahl's strong 1983 performance. Revenues for the year were flat at $779.2 million, and net income tumbled 22% to $36.4 million. Amdahl does about a third of its business overseas, where the strength of the dollar hurt its earnings.

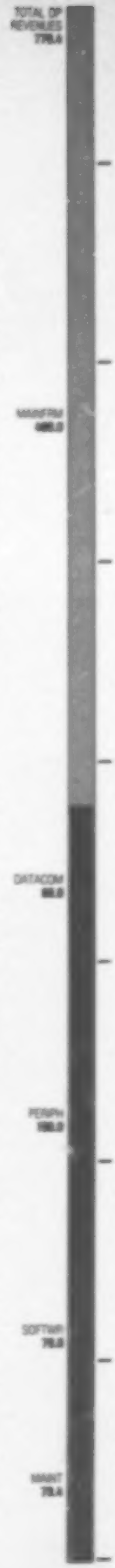
Stung by poor results early in the year, Amdahl embarked on a series of cost-cutting measures, including the layoffs of 280 employees, and by the fourth quarter the firm seemed to be on an even keel once again. At year-end, the firm had increased its payroll by 400 employees, bringing it to 7,000.

Amdahl maintained its position as the largest domestic alternative supplier of IBM-compatible mainframes and peripherals, but its share of the large systems market continued to decline, dropping one percentage point to 11%. Processors made up about half of the company's business. The mainframe business once again was hurt by product delays, although in 1984 Amdahl finally started shipping new versions of its 580 processors and achieved compatibility with IBM's MVS/XA operating system.

Amdahl seems to recognize the continuing potential for trauma in the mainframe market, and consequently has continued to diversify its offerings. In 1984, revenue from storage systems jumped almost 50%, much of it from leases. A big part of that gain is due to the 6380, the 3380-compatible disk drive that Amdahl started shipping in volume last year. On the negative side, production delays at Fujitsu prevented Amdahl from filling a large General Motors contract on time, threatening the pcm's chances of winning future contracts with the big automaker. In the communications sector, the 4705 series of front-end processors scored strong gains in 1984.

Late in the year Amdahl entered the supercomputer market, selling two machines manufactured by Fujitsu. Amdahl is the third U.S. company to produce supercomputers, but it is the only one whose offerings are compatible with IBM mainframes. Amdahl also diversified in the software arena, throwing its support behind Unix-like environments for mainframes. Its version of Unix, UTS, was introduced, and immediately took precedence over the unannounced Aspen transaction-processing operating system that Amdahl has been developing.

In March, Amdahl's Japanese business partner, Fujitsu Ltd., bought an additional fifth of the company, giving it 49.5% of the company. Fujitsu currently supplies all of Amdahl's mainframes, supercomputers, and storage devices, giving the firm a degree of price protection and access to advanced technology. Fujitsu has said it has no plans to acquire more of Amdahl than it already has.



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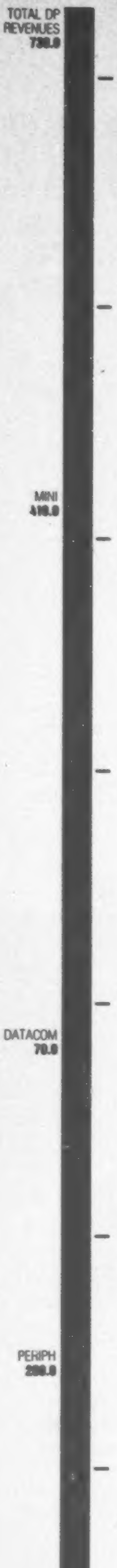
CIRCLE 43 ON READER CARD →



37

HARRIS CORP.

1025 W. NASA Blvd.
Melbourne, Fl 32919
(305) 727-9100

Harris, long known as a scientists' and researchers' company, continued trying to shed the horn-rim image and transform itself into a market-driven enterprise. Potential customers may even get the message.

For calendar 1984, sales were up an acceptable 18%, to $2.19 billion from 1983's $1.86 billion. Net income, however, jumped 30%, to $90.7 million. Harris's Information Systems Group, which includes all its dp business, outperformed the rest of the company. Dp revenues on the year rose 26% to $730 million, up from 1983's $580 million. As was true for Harris's other four divisions, the Information Systems Group (ISG) continued to benefit from government contracts. Between 40% and 50% of the company's sales were to the government, a stable business growing by about 20% annually.

The ISG's dp business consists of a minicomputer operation, Lanier Business Products, and a terminals division in Dallas. The two systems sectors performed well, but the terminals division behaved like an errant black hole, swallowing profits from the other two areas and emitting not a photon of good news. Price cuts by IBM and severe internal problems ravaged the division, and in early 1985 Harris decided to dump it.

Sales of ISG's mainstay product line, a family of 32-bit scientific and engineering superminicomputers, were strong. Significant new products were Vue, a coresident VOS and Unix operating system implementation; an Oracle back-end database system; and a 32-bit Unix-based engineering workstation. Breaking with tradition, Harris released a low-end mini, the H-60, designed as a departmental system.

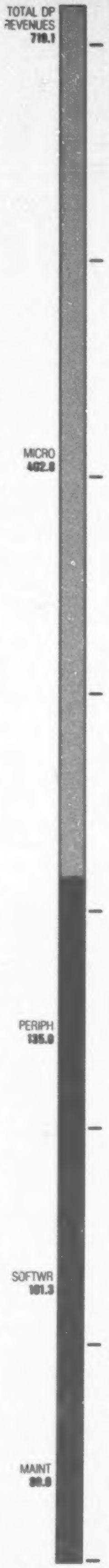
Harris product announcements in early 1985 showed its perseverance in competing in the crowded office automation market. It unveiled HarrisNet, a local area network; Harris PC, a personal computer compatible with IBM office equipment; and the 20-20 network voice and data switch.

Harris's semiconductor operation, while not included in dp revenues, is still an important factor in the industry. The operation is the top supplier of gallium arsenide chips, and signed an agreement with Cray Research to provide the technology for use in Cray's forthcoming supercomputers. The company also came out with a CMOS version of the Intel 8088 microprocessor. Semiconductor sector sales were hurt, however, by the industrywide chip glut at the end of the year.

The communications group did better after several flat quarters, largely as a result of a smaller proportion of sales to impoverished OPEC governments hurt by the strength of the dollar.

Lanier, in its first full year as part of Harris, performed better than it had as an independent company. The business systems supplier, while unable to integrate its products with the Harris line, has apparently been able to teach its new parent some marketing skills to complement Harris's technological and management strengths.

Revenue figures are in millions of dollars. Each increment represents $100 million.



38

TANDY CORP.

1800 One Tandy Center
Fort Worth, TX 76102
(817) 390-3700

Songwriters declare that the sun has a habit of coming out tomorrow—a comforting thought considering the bleak horizon Tandy has faced through 1984. Dp revenues were down 24% to $719.1 million from $945 million in 1983. While total corporate revenues stayed almost level, rising slightly to $2.79 billion from 1983's $2.66 billion, net corporate income decreased 19.8% to $235.9 million from 1983's $292.7 million.

Chairman of the board John V. Roach blamed some of the uninspiring financial news on damage to foreign sales caused by the strong dollar: sales outside North America accounted for 21% of Tandy's business in 1983 and only 15% in 1984. But maturing products may have been partly to blame. In a 1984 quarterly report Tandy described the villain this way: "Gross margins may continue to be adversely affected . . . as the microcomputer progresses through its product cycle."

As part of a program to put some renewed zip into its balance sheet, Tandy introduced its entry in the IBM PC-compatible race, the Tandy 1000. Launched in December, the machine costs just $1,200. It has a 360KB floppy disk format and can run IBM PC software including MultiMate, dBase III, and Lotus 1-2-3. The product uses an 8088 16-bit microprocessor operating at 4.77MHz.

Unfortunately, Tandy's timing was rotten. Most of the IBM PC-compatible competitors made their debuts in 1983 and have therefore had time to build some momentum in the marketplace. In addition, IBM has been reducing the price of its PC offerings, making it almost impossible for a rival vendor to be sure there's room under the IBM umbrella for profitable sales.

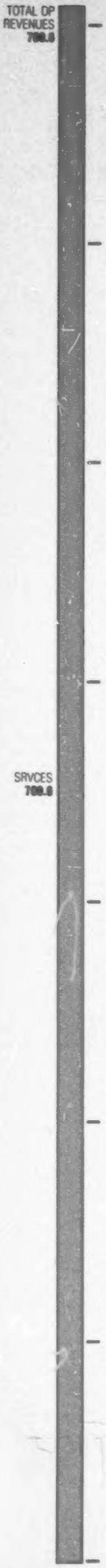
Tandy's piece of the home computer market may prove to be of little help. With IBM's discontinuation of its PCjr, companies are beginning to wonder whether a home computing audience exists. Certainly, sales and revenues are nothing to cheer the heart of a corporate comptroller. Tandy's 1000 (also aimed at the home market), the TRS-80 Model 4, and the Model 100 have all had a disappointing year. Even with discounted prices on the Model 4 and the Model 100, their lack of compatibility with IBM continues to be a major problem.

Exploring new enterprises, Tandy and Applied Computer Techniques PLC have begun a joint retailing venture directed at the U.K. market. The original announcement in December said the new company, AT ComputerWorld Ltd., would open throughout Europe. But after careful study the project budget was cut from the originally estimated $11 million figure to $5.6 million. The main focus is now centered on franchises in the U.K.

Tandy's vertical control of its retail delivery systems continues to be a corporate strength, and Wall Street analysts have suggested that the current drop in the value of the dollar will help international sales and the 1985 balance sheet.

Revenue figures are in millions of dollars. Each increment represents $100 million.

← CIRCLE 42 ON READER CARD



39

COMPUTER SCIENCES CORP.

2100 East Grand Ave.
El Segundo, CA 90245
(213) 615-0311

Computer Sciences Corp., a granddaddy among systems houses, was known as a highflier in the '60s and a hard luck company in the '70s. So far the '80s look solid but uninspiring.

The company celebrated its 25th birthday in 1984, a bright spot in an otherwise lackluster year. Revenues of the company, which calls itself the world's largest independent computer services company, bogged down in '84. This was due in part to the pressures felt throughout the services industry because of the burgeoning microcomputer. More specifically, however, the downturn could be blamed on CSC's failure to win the kind of $100 million plus government systems contracts that had bolstered its bottom line in earlier years.

Corporate revenues dipped from $718.9 million in calendar 1983 to $709.6 million in '84. While earnings were up from $15.9 million to $27.6 million, the increase was due, in large part, to the sale in December of a wholly owned subsidiary, PAID Prescription Inc., Fair Lawn, N.J., to Porex Technologies Corp., Elmwood Park, N.J., for $28 million.

Not counting the extraordinary income generated by the sale, operating income for the fourth calendar quarter (the firm's third fiscal quarter) was $9.9 million compared with $12.1 million in 1983.

Systems, traditionally the company's largest revenue-producing sector, was the big sufferer from the lack of major government contract wins. Its revenues in the calendar fourth quarter were up a modest $7 million, to $127 million from $120 million, bolstered by a $14.1 million contract for an FAA system in October and a $18.8 million GSA contract in December, running three and four years, respectively.

The Information Network Services Group, which operates Infonet, CSC's value-added network, suffered in '84 as did others in its business, from the continuing displacement of remote services by dedicated computer systems. CSC is trying to redirect its network toward a communications services value-added utility business, developing new databases and services to interface with client computers.

CSC has been trimming Infonet costs. Staff has been reduced, and where there were three data centers there now are two. Software development programs for new products for traditional timesharing services have been terminated as well.

The strongest growth for CSC in 1984 came in its industry services sector. Reduced earnings from a contract with the State of California to administer its MediCal program were more than offset by gains from a National Flood Insurance Program and by revenue gains by Associated Credit Services, a Houston-based credit reporting subsidiary, which expanded late last year with the acquisition of the Merchants Association of Indianapolis. The company said this was part of a series of planned acquisitions. Corporate acquisition activity is expected to increase following the hiring early this year of acquisition specialist Larry Parkus from AT&T.

Revenue figures are in millions of dollars. Each increment represents $100 million.

40

PRIME COMPUTER INC.

Prime Park
Natick, MA 01760
(617) 655-8000

A healthy new element was evident in Prime's business last year: aggression. Product announcements and hiring picked up strongly. And for the first time in recent years there was some real bite evident in the company's pricing. The net result was that total revenues climbed 24% to $642.8 million. More impressive after 1983's poor showing, earnings jumped 83.6% to $59.7 million (including a $10.6 million nonrecurring gain).

Prime's overseas business grew at an even healthier rate, 29%, and contributed 39% of total revenues by year-end—one of the largest percentages by a dp company, and reminiscent of IBM's own 60/40 split. According to Prime, 27% of its sales are in Europe, and another 12% comes from other offshore areas including the Far East. The company's overseas focus left it more than unusually prone to the strength of the mighty dollar. According to its own internal estimates, Prime's international business would have grown at 40% were 1983 exchange rates in effect throughout 1984.

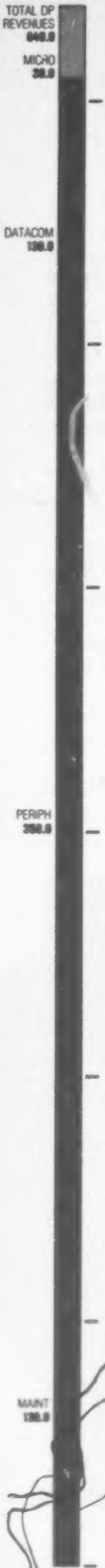
For some time now the company has been heavily criticized for its aging midrange systems and for its conservative pricing. Management moved to dispel both perceptions last year. New middle-of-the-line 9650 and 9750 minis were announced, the former a TTL machine, the latter benefiting from leading-edge ECL and pipelining technology. Prime addressed its low end earlier in the year: its new 2550 is 45% faster than the machine it replaced, the three-year-old 250-II.

Toward the end of the year, the company embarked on a new, more aggressive pricing strategy. Since October the company has slashed the price of its Medusa CAD software (which it now co-owns with Computervision and markets on a worldwide basis) by 40% and reduced the price of the 2250 by 25%. Consequently, from the third quarter to the fourth Medusa licenses jumped 32% and Prime sold 15% more 2250s. In January of this year, Prime replaced its line-topping 9950 with the 9955, offering up to 60% more performance for 6% less cost. The company said that twice as many terminals can be hooked up to the new 4 MIPS machine as could be served by the 9950.

The company was also more aggressive in its hiring. Total sales personnel grew 11% and 12% in the final two quarters. Increased staffing was also heavy on the customer support side. Since 1982 the company has doubled its personnel in this crucial handholding area. Support revenues responded accordingly, soaring 64% to $163.7 million, some 25% of the company's total business.

Although Prime's aggressive pricing actions should lead to an improvement in its growth rate, the benefits may be only short term without further actions to improve its relative market position. The company is comparatively weak in the areas of workstations and office automation, and is expected to tackle these shortcomings this year.

Revenue figures are in millions of dollars. Each increment represents $100 million.



41

ITT CORP.

320 Park Ave.
New York, NY 10022
(212) 752-6000

Still trying to get in step with the high-tech times, ITT remains weak on the dp product side. For example, the corporation's Courier Terminal Systems subsidiary last year began shipping the Xtra, its IBM PC lookalike, but shipping doesn't always equate with selling, which was sluggish last year despite Computerland distribution. DATAMATION estimates that micro revenues only reached $30 million last year.

In mid-'84 ITT ordered a reorganization of its Communications and Information Services division, hoping to stop a trend that had the division—once one of the corporation's most profitable—chewing up a sixth of ITT's corporate capital resources to produce only 4% of its revenues.

The picture was not much brighter from the peripherals point of view. DATAMATION estimates that sales in this sector were off 12.5% to $350 million. Stronger competition forced ITT's printer-and-memory maker Qume to close its San Jose manufacturing plant, putting some 600 employees out of work. Also on the peripherals front in 1984, ITT unveiled the 9232 IBM-compatible terminal.

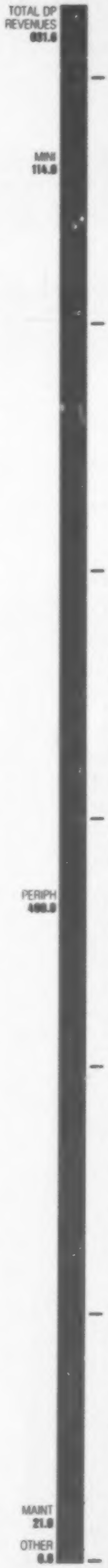
To fund its drive for more power in the dp market ITT has been putting up some of its lackluster subsidiaries for sale. Along with the sales, though, have come some surprising dp purchases, especially in Europe, where ITT has been hurt by the strong dollar. ITT's biggest dp deal in Europe last year was for the bankrupt Christian Rovsing, the largest computer and networking systems company in Denmark. ITT's Danish subsidiary Standard Electrik Kirk bought 44% of the systems division of the Rovsing company, which pulled in $166 million in European dp revenues in '83.

The U.S. multinational also went shopping in West Germany, where it bought 49% of Computer-Technik, a $38 million manufacturer of minicomputers and micros. Earlier last year, ITT took a 37% stake in Holland Automation International, a $6 million Dutch company that specializes in software for pc-compatible micros and banking minis. In Britain, ITT trimmed its stake in Standard Telephones & Cables prior to STC's buy into U.K. mainframer ICL.

Europe has traditionally generated more datacom than dp business for the diversified company. ITT has launched a major PBX push in Europe, where it's done a much better job selling switches than it has on its home turf. (ITT, which agreed last year to distribute Hitachi's digital exchanges in the U.S., has less than 2% of the domestic switch market.) Although ITT has a strong following among European PTTs, few observers of the telecom scene feel the company will ever recoup the estimated $1 billion it has sunk into its showcase System 12.

The conglomerate may also be sinking billions into buying a major dp company. Takeover talks with Sperry earlier this year were called off, but ITT still has an acquisitive eye. Nevertheless, industry watchers feel it will take more than mere money and mergers to get ITT on solid ground in the dp domain.

Revenue figures are in millions of dollars. Each increment represents $100 million.



42

TRIUMPH ADLER AG

Fuertherstrasse 212
P.O. Box 4955, D. 8500
Nuremberg 80, West Germany
(49-911) 3221

The transition from a sleepy typewriter company to a fast-track office systems firm isn't easy. That's exactly what Germany's Triumph Adler, a subsidiary of car maker Volkswagen, is beginning to learn. In fact, if it weren't for its U.S. subsidiary, Pertec, TA might not have made it into this year's DATAMATION 100.

Pertec, which has strong peripheral and computer sales in the U.S. and South America, was consolidated into Triumph Adler's annual figures in 1983 and last year contributed 78% of the company's $631.6 million (DM1.80 billion) dp revenues. The two companies' combined losses in '84 were even bigger than the $20 million deficit in 1983. These losses were not good news for parent company Volkswagen, which began applying a lot of pressure to its TA offspring. Last summer Wolfram Nadebusch, the former head of Volkswagen Nigeria, became TA's new chief executive. To stem the flow of losses, Nadebusch began streamlining the company's German manufacturing operations and splitting up production. These moves, which helped improve production, also created worker turmoil. Last year, many of TA's manufacturing employees went on strike for seven weeks in an attempt to get a 36-hour work week.

Triumph Adler's dp product line consists of the Alphatronic range of office systems and microcomputers, and the 1600 series minicomputers. Both the Alphatronic P60 and P50 micros are IBM-compatible and have interfaces for the German Bildschirmtext videotex system. Last August the company added three new models to its 1600 mini line. Triumph Adler also sells an Ethernet-like local area network called Ergonet.

The company expanded its product line with the introduction of the M32 multi-user system that's based on a Xenix derivative called TAnix. This is partly the result of a deal Triumph Adler struck with Microsoft last year.

Triumph Adler's micro and mini wares have been moderately successful outside the company's home market, which accounted for about 50% of its 1984 dp revenues. The French, British, and Italian markets provided most of the remaining sales. After years of losses, Triumph Adler's U.K. arm finally made a profit in 1984.

Pertec has faired much better than Triumph Adler. One thing that helped was the 3200 and 4200 machines that are based on the Motorola 68000. Triumph Adler was so impressed by the machines that it pumped $45 million into the U.S. company to cover R&D expenditure during 1984 and 1985.

NCR's Applied Digital Data Systems (ADDS) was also impressed and tried to buy Pertec last fall, but the deal never went through. Some say the reason was that Volkswagen wanted to hang on to the U.S. company. Other industry watchers claim that ADDS balked for fear Pertec would be too tough a company to turn around in a reasonable amount of time.

Revenue figures are in millions of dollars. Each increment represents $100 million.

43

MOTOROLA INC.

Motorola Center
1303 E. Algonquin Rd.
Schaumburg, IL 60196
(312) 397-5000

As an official sponsor, Motorola wasn't about to be left out of 1984's Olympic excitement, providing communications systems for both the winter and summer games. The company went for its own gold in '84 and broke the tape, with both sales and earnings hitting all-time highs. Total revenues were $5.53 billion, up 27.8% from 1983's $4.33 billion. Net earnings before the addition of a $38 million DISC tax break rose to $349 million, up 43% from 1983 net earnings of $244 million. The impressive gains were deflated, however, by Motorola's ballooning debt load. Corporate debt soared to $642 million, more than twice the $270 million in 1983.

The Information Systems Group (ISG) showed respectable gains, with sales up 20% from 1983 and new orders advancing 14% through the year. The group turned 1983's small operating loss into a small operating profit in 1984. ISG's four divisions—Four-Phase Systems Inc., Codex Corp., Universal Data Systems, and International—expanded in 1984 with new products in the data transmission and ddp areas. Direct sales and service operations in international markets also looked more promising.

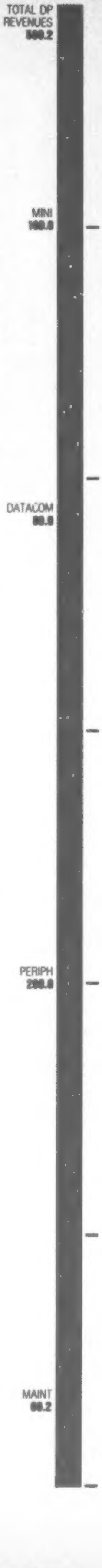
Four-Phase went through a reorganization in 1984. It streamlined its management and administrative systems, consolidated its field sales and service operations, and implemented a product management organization. Five top-level executives were recruited to help implement the changes and run the company. In addition, Four-Phase introduced the series 6000 front-office systems, based on Motorola's 68000 microprocessor and Unix, with software for word processing, spreadsheets, software development, database management, and data collection.

Codex introduced several new products, including the 2600 series of 16.8Kbps modems. Codex's new 6240 Digital Transmission Multiplexer is a time division multiplexor designed to integrate voice, data, and video transmission over T1 (1.5Mbps) circuits. Development of a new series of microcomputer modems kept Universal Data Systems busy. The FasTalk series includes 300bps and 100bps standalone models and a 1,200bps plug-in card for IBM PCs.

Internationally, Codex equipment was purchased for use in large private networks in West Germany, the U.K., Belgium, Portugal, Korea, and Turkey. Mobil Oil of West Germany got behind the Motorola banner as well by signing a contract for 10 Four-Phase series 5000 systems.

In the communications sector, the ring of the cellular telephone dulled for Motorola in 1984. After a strong first half, operating losses for the phone business increased with the delay in several major cities of licensing and construction permits. Motorola also blamed some competitors, charging in an antidumping petition with the U.S. International Trade Commission and the Commerce Department that rivals sold Japanese cellular products at "less-than-fair value." A decision is expected this year.

Revenue figures are in millions of dollars. Each increment represents $100 million.



44

DATAPOINT CORP.

9725 Datapoint Drive
San Antonio, TX 78284
(512) 699-4428

Still reeling from an accounting scandal in 1982, still experiencing delays in development and marketing, with customer loyalty on the wane, things couldn't have gotten any worse for Datapoint in 1984. Then they did. On Dec. 10, the *Wall Street Journal* reported that corporate raider Asher B. Edelman had acquired a chunk of Datapoint stock with the intention of buying more, taking control of the company, and selling it off bit by bit.

The stock went up, orders went down. Management turnover increased, employee morale decreased.

Then things got worse.

The company announced a $15.9 million loss for the quarter ended Jan. 26, 1985, its first quarterly loss since 1982. Earnings for the calendar year also plummeted, to a loss of about $900,000, down from 1983 earnings of $20.6 million. Revenues were up only 6.2%, to $589.2 million from $554.4 million.

Datapoint had begun 1984 with guarded optimism. The company increased its controlling interest in its French subsidiary, Datapoint Matra Informatique, to 100% and became a large-scale customer of, and investor in, Charles River Data Systems. It implemented a huge stock repurchase plan. It opened up ARC network, its pioneering proprietary local area network, in an attempt to recapture lost market share. It introduced the Convergent Technologies-built Vista-PC and the Datapoint 3200, a 32-bit supermicro.

In June Datapoint reached an agreement with the Securities and Exchange Commission, terminating the investigation of the 1982 accounting scandal, by admitting nothing but, at the same time, promising never ever to break the rules again. It reported record earnings for the fiscal fourth quarter ended July 28. It even supplied a vote-tallying ARC network for the Democratic National Convention.

But, like the Democrats, Datapoint should have been more guarded with its optimism. The new products didn't take off and slashing prices on the Vista-PC in response to aggressive IBM AT pricing didn't help. International orders (representing a third of Datapoint's business) were down. And by the end of the year, Edelman's takeover bid had withered what was once thought to be one of the strongest customer bases in the industry.

For three months, management fought. Nobody wanted the company to be put on the block, piecemeal, to be stripped of its strongest and most profitable units. Suits and countersuits flew. Then the huge quarterly loss was announced. In March, a "reconstitution" of the board of directors was announced, ceo Harold E. O'Kelly stepped down, and Edelman took his place.

Could things get worse? Apparently they could. According to the annual DATAMATION/Cowen & Co. survey on user spending, the number of users who anticipate reordering Datapoint ddp systems, once Datapoint's strongest suit, is a big zero.

Revenue figures are in millions of dollars. Each increment represents $100 million.

45

TANDEM COMPUTERS INC.

19333 Vallco Parkway
Cupertino, CA 95014
(408) 725-6000

Tandem Computers Inc. continued to plug along through 1984 in a nonstop—if decelerating—fashion. There still appeared to be glory enough for all as Tandem's data processing revenues were up 25.6% to $565.9 million—a good year by anyone's reckoning, even if it pales compared to the 34% and 41% gains shown in 1983 and 1982. The largest chunk of Tandem's money came, not surprisingly, from minis: $447.1 million, with another $88.8 million flowing in from maintenance and repair contracts.

Still the dominant leader in fault tolerant systems, Tandem started shipping product in 1976 and had the market virtually to itself until 1980. While it has since yielded share to others—most notably Stratus—some analysts see the market for fault tolerant machines continuing to grow at 30% for the rest of the decade. So far, Tandem is clearly the leader of the pack. To maintain that position, the company hiked up its R&D expenditures in 1984 nearly 40%, to $56.8 million. A big chunk of that went toward achieving high-level SNA compatibility with IBM machines. The payoff was visible in the firm's profits for 1984, which markedly outperformed revenues. Net income for the year was up a hefty 39.1% to $46.9 million.

Wary of growing lackluster by selling largely into its well-entrenched installed base, Tandem sought to expand its horizons. The firm stepped up its campaign to acquire new third-party software, slashed prices on its low-end NonStop I and II gear, and offered heftier volume discounts to oems.

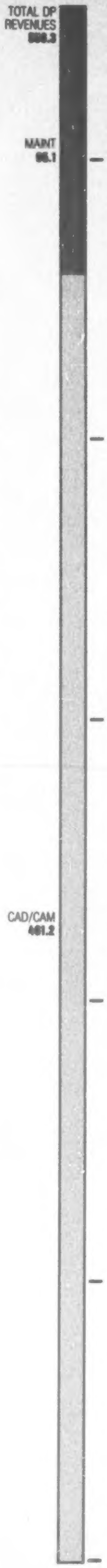
Tandem also entered into a series of major new agreements. It won a substantial order from Federal Express for gear to be used in the Zapmail program, entered into a joint venture to market airline reservation systems and allied airline software for end users including Scandanavian Airline Systems, and signed an accord with Indiana Bell to market order-entry software that the phone company developed for its own Tandem installation.

Tandem also came to market with new hardware during the year, led by its line-topping NonStop TXP system and the 6100 communications subsystem. Two smaller terminals were added to its 6530 line, offering 3270 emulation and voice input. Also introduced was the Dynamite workstation, driven by an 8086 chip running MS/DOS for local processing.

Tandem's money matters were clouded late in the year as the Securities and Exchange Commission charged it had overstated its fiscal 1982 revenues. Without admitting or denying the charge, Tandem agreed to annual reviews of its accounting practices for three years.

But clouds have appeared in the future of Tandem's lock on first place in the fault tolerant arena: IBM's deal with another strong fault tolerant vendor, Stratus, will—at the very least—raise the cost of staying on top in nonstop computing. If AT&T ever gets its marketing as bug-free as its time-tested fault tolerant systems, the market could be turned upside down.

Revenue figures are in millions of dollars. Each increment represents $100 million.



46

COMPUTERVISION CORP.

15 Crosby Drive
Bedford, MA 01730
(617) 275-1800

For Computervision, a pioneer in the CAE/CAD/CAM market, 1984 was anything but smooth sailing. Even so, for the first time Computervision posted revenues of over half a billion—$556.3 million. This marked an increase of 39% over its 1983 revenues of $400.4 million. On the down side, this was also the first year that Computervision's shares traded at a lower price than those of its main competitor, Intergraph.

Profits were up a relatively modest 17%, to $41.4 million in 1984 from $35.3 million in 1983. As the competition grows tougher, Computervision has had to become more aggressive. Long criticized for building its own hardware instead of buying it (as Intergraph does), Computervision made its first oem agreements in 1983, with IBM and Sun Microsystems. This year, it's gone a few steps further.

First, it added two new product lines, the CDS 3000 and CDS 5000. The 3000 series is a 32-bit workstation for use in standalone or networked design and engineering applications. The 5000 is a high-end CAE/CAD/CAM system for dealing with large amounts of data and accessing corporate databases. The 5000 is based on IBM 4300 processors.

As a second step, in July, Computervision revealed its plans to market Medusa software for CAD/CAM applications, using DEC's VAX computers under an oem agreement with DEC. Medusa is a design and modeling system developed by Cambridge Interactive Systems Ltd., a Computervision company since 1983.

Finally, near year-end, Computervision announced a major market-oriented organizational realignment designed to better position the company for the future. The concept behind the realignment is "decentralized operations organized under major groups to serve specific industries." Five self-contained groups were organized—the North American Group, the International Group, the Business Development Group, the Product Group, and the Operations Group—each under the direction of a former Computervision division general manager.

In addition, the company entered a joint venture with the Metheus Corp., Hillsboro, Ore., now called Metheus-CV Inc. The new company will design, develop, and market CAE workstation products, and will combine products and personnel from both the companies. Earlier in the year, Computervision also acquired the Organization for Industrial Research (OIR), Waltham, Mass., a major supplier of CAD/CAM software.

Evidently, Computervision is taking a fighting stance. Some analysts predict that IBM will eventually dominate this market, and that Intergraph and Computervision will have to slug it out for second place. So far in 1985, the market omens for Computervision have not been good. Early this spring it laid off almost 1,000 workers, 14% of its total work force. Analysts suggest that its problems are due to fears that some of its products, now made by other suppliers, won't be able to communicate with one another.

Revenue figures are in millions of dollars. Each increment represents $100 million.

47

NATIONAL SEMICONDUCTOR CORP.

2900 National Semiconductor Dr.
Santa Clara, CA 95051
(408) 749-7420

In 1984 we're almost talking wild, giddy, pie-in-the-sky success for National Semi. Every time the company wrote down a number, it set another record. Dp revenues, which had jumped 16% in 1983, rose 29% to $550 million. Mainframes, supplied by Hitachi and marketed by the National Advanced Systems division, leaped 25% to $250 million. Peripherals increased 33% to $200 million, and maintenance and repair rose 33% to $100 million. Total corporate revenues rose 31%, to $1.82 billion. R&D also got its money's worth, rising 38% to $158.5 million on a corporate basis and 12% to $27.1 million for dp purposes. Net corporate income jumped an astounding 528%, to $84.2 million from $13.4 million.

So much for the good news. The bad news is that the semiconductor market stalled toward the end of the year. That shouldn't affect NAS's computer business, though. The company expects big things from its IBM-compatible AS/XL family. Sensing a potential IBM weakness—its delay in marketing the Sierra line—NAS hopes to seize the time: it wants to bring its 28MIPS uniprocessor AS/XL model 60 and 50MIPS dyadic model 80 to market at least a year earlier than IBM's models 200 and 400. Current machines are also selling well. Announced a year ago May, the AS/8040, 8050, and 8060 have shipped in "large quantities," the company said. The AS/6600 and AS/9000 lines also sold well.

National expects big things from its 32000 series microprocessors. A 32-bit cpu, the NS 32032, was introduced after more than $45 million had been invested in R&D. But that didn't stop it from having a few problems in getting up to speed. Even though Motorola and AT&T are the only other companies with comparable products, the 32032 has barely made a ripple, much less a splash. "It's just not a big deal yet," says John Geraghty of First Boston.

Neither is the company's Unix product, although it may become one. NAS in July delivered Unix System V Release 2.0 for the 32000 microprocessor to AT&T. When AT&T validated the product early this year, that, according to the company, made it the only semi maker to implement Unix V so far.

Life became much easier when NAS got off IBM's hit list. The company had been accused of stealing trade secrets, with IBM claiming low-end damages of $750 million and high-end injury of $2.5 billion. The suit was settled in January 1984. In return for IBM not getting a penny, NAS promised not to solicit, use, or distribute any IBM-protected products.

National also escaped the Defense Logistics Agency's blacklist. After a 40-count indictment, the company had been convicted in March of improper military-aerospace testing procedures. The DLA then proposed to debar the company from further DLA business. It never came to that, as the parties settled their differences in August and National paid the government $247,000.

But with the profits it had, who noticed?

Revenue figures are in millions of dollars. Each increment represents $100 million.

48

DATAPRODUCTS CORP.

6200 Canoga Ave.
Woodland Hills, CA 91365
(213) 887-8451

Dataproducts had another big year in 1984: revenues, net income, earnings per share, and orders all hit record highs.

The company continues to be the world's largest independent manufacturer of computer printers, printer supplies, and components. Last year it recorded $484.5 million in worldwide revenues, up a substantial 41% from 1983. Of this total, 13% came from Europe, 5% came from the Far East, and the bulk of it, 82%, came from North America. Net income increased a whopping 87% to $35.8 million, from $19.1 million in 1983. Just two years ago the company net income had declined by 50%.

An improved economy played a large part in Dataproducts' improved sales in both the high and low ends of its product line. Orders in 1984 increased by 39% over 1983. Two important new oem contracts were signed with IBM and Burroughs. Dataproducts continued to expand its worldwide customer base with distributors and dealers throughout the world serving systems houses, retail dealers, and end users with its low-end products.

The DP-55, a high-performance daisywheel printer, was put into volume production in 1984. In addition, a multiyear contract was signed with Wang for the DP-55, giving a big boost to the company's daisywheel production.

The company continued to expand its product base, a process begun in 1978, when it offered only line printers. New-product investment was greater than in any other year, amounting to $31.2 million. Waiting in the wings and slated for 1985 release is a state-of-the-art laser printer.

Dataproducts formed a joint venture with Grupo Latino Mexicano in which printers, assembled from components made in both the U.S. and Mexico, will be marketed to companies located in Mexico.

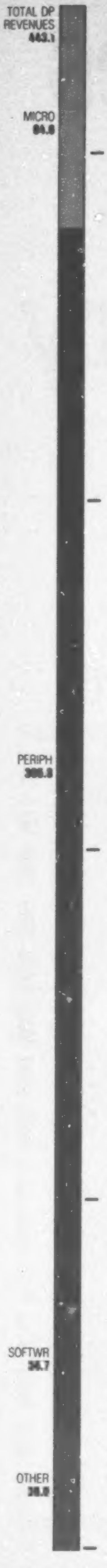
Increased sales required yet another manufacturing facility at the company's Milford, N.H., plant, which it acquired from Integral Data Systems in 1982. It is now known as Dataproducts Serial Printer Group/Milford. When the new facility is completed in the latter part of fiscal year '85, the plant's present capacity will be tripled. The company also has manufacturing facilities in southern and northern California, Connecticut, New Hampshire, Ireland, Hong Kong, and Puerto Rico.

Reflecting the growth of the company, the board of directors was increased from nine to 11 members, and 300 additional employees were hired to reach a total of 5,800 employees worldwide.

Charles A. Dickinson, Dataproducts' president and ceo, attributed his company's excellent year to the continued success of its band printer product lines as well as the strong performance of the newer serial printer products.

In addition to computer printers, supplies, and components, Dataproducts also produces data communications and aerospace equipment.

Revenue figures are in millions of dollars. Each increment represents $100 million.



49

C. ITOH ELECTRONICS INC.

5301 Beethoven St.
Los Angeles, CA 90066
(213) 306-6700

Giant Japanese trading companies generally remove a lot of the pain and frustration usually experienced by American firms selling and servicing high-technology products in Japan and, in turn, open U.S. markets for Japanese companies. C. Itoh Electronics—a subsidiary of C. Itoh & Co. Ltd., the world's third largest trading company behind Mitsui and Mitsubishi—did more than $443 million last year selling high-technology Japanese products in the U.S. and exporting U.S.-made products to Japan.

That's a small percentage of the more than $60 billion that the giant trading company did last year through its worldwide operations in 86 countries—an increase, by the way, of $8 billion over the year before. The subsidiary's dp revenues, however tiny in relation to the parent, recorded a sizable increase over 1983, and they are still growing. Overall, C. Itoh Electronics pulled in $531.1 million in 1984 revenues, with data processing content accounting for all but $8 million of the $90 million increase from the previous year.

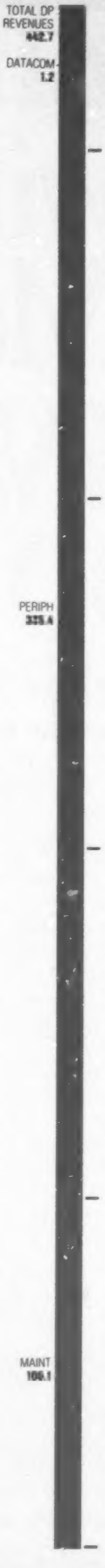
The electronics operation has been under way for nearly a dozen years. More than two dozen U.S. firms use C. Itoh Electronics to sell their products in Japan through two C. Itoh affiliates there—C. Itoh Data Systems Co. Ltd. and Century Research Center Corp. Products representing such fields as data processing, office automation, CAD/CAM, factory automation, software, and computer services are included. Among the U.S. companies selling in Japan through C. Itoh are General Electric's Calma division, Hughes Aircraft, MDS Qantel, Digital Communications Associates, and Sytek.

Japan-made products are sold in the U.S. through C. Itoh Electronics and two subsidiaries, CIE Systems and CIE Terminals. CIE Systems sells microcomputer business systems and software. CIE Terminals sells a variety of graphics terminals that are compatible with Digital Equipment Corp. and Tektronix offerings, as well as with a family of 300- and 600-line-per-minute printers. C. Itoh Electronics sells printers, monitors, floppy disk drives, handheld data-entry devices, a terminal that is compatible with IBM's model 3178/3278 terminals, electrostatic plotters, and portable facsimile telecopiers.

Key to the company's strategy is its goal not only of selling these products, but also of servicing them, stocking spares, and engaging in market studies. Company officials say they want to appear to be a domestic company in both the U.S. and Japan. C. Itoh Electronics has remained stable with steady growth since its inception in Los Angeles in 1974. It and its two subsidiaries—CIE Systems and CIE Terminals—are headed by Mark Takeuchi, a graduate electrical engineer who was named president in 1976.

The Electronics company's activity is not affiliated with C. Itoh Digital Products of Torrance, Calif., which sells printers, plotters, and utility software. That operation is also a subsidiary of the trading company.

Revenue figures are in millions of dollars. Each increment represents $100 million.



50

TELEX CORP.

6422 E. 41st St.
Tulsa, OK 74135
(918) 627-1111

In the rough-and-tumble terminal business, Telex Corp. managed to have a great 1984. Record worldwide corporate revenues totaled more than a half a billion dollars. Dp revenues were twice 1983's levels. These dp sales and a change in the company's European marketing policy contributed most to the vendor's success.

The Tulsa, Okla.-based vendor of computer peripheral and communications equipment posted revenues of $523.8 million in 1984, a $200 million increase over the previous year. Net income was up a healthy 40.8%, $13.8 million over 1983 to $47.6 million.

The acquisition of Raytheon's Data Systems Division gave Telex a financial boost as well as a strong entry into the airline terminal market. Raytheon, with 50% of the commercial airline business, sold its ailing terminal division (losses said to exceed $100 million) to Telex for $200 million. Telex, which picked up Raytheon's customer base and accounts receivables, will now attempt to put the former Raytheon division back on course. Word on Wall Street has it that integrating Raytheon Data Systems into Telex has produced income and results that have surpassed the company's budgeted expectations.

On the international front, Telex was precluded for several years from selling directly to Europe under a 1978 agreement by which Telex's European subsidiaries were sold. Since restrictions were lifted in 1981, Telex has been marketing directly to Europe. But in its third year under the new rules, the company still derives only 19% of its revenues from the international market. Geographically, the United States accounts for 81% of sales, West Germany 7%, Australia 6%, the United Kingdom 4%, and France 2%.

On its home front, with Raytheon now an inhouse strength rather than a competitor, Telex has a sure hold on the number two market share for 3270 terminals. While IBM still occupies the top spot with a 62% share, Telex has 18% of the business; ITT Courier is in third place with 10%. Despite the encouraging numbers, however, low margins, cutthroat competition, and increased terminal marketing efforts by IBM will keep Telex on its toes.

Not surprising is the fact Telex upped its research and development spending by $7 million to $21.6 million. The company says it is spending more than $1.3 million per month on product development and engineering to keep a competitive edge.

In a move to open new markets, Telex has sought out what it calls "affiliations" with other computer vendors. It joined with Burroughs Corp. to form Plasma Graphics Corp., which designs flat displays using gas plasma technology. Another deal was struck with MAD Computer Inc. to develop an advanced IBM-compatible microprocessor. According to Telex, the company is not straying too far from its roots and adds that both deals complement its basic terminal business.

Revenue figures are in millions of dollars. Each increment represents $100 million.

51

RACAL ELECTRONICS PLC

Western Rd., Bracknell
Berkshire, England
(44-344) 483-244

Sir Ernest Harrison, whose Racal Electronics group has long been a favorite on the British stock exchange, has been biting his nails recently. While dp revenues of £309 million ($412 million) were up, profits were down sharply for the latter part of '84.

Six-month net income slid 3% while sales climbed 16%, and the company warned that profits for the rest of its fiscal year would be low. Investors promptly trimmed $342 million off Racal's market value on the London stock exchange—a 17% paper loss.

At the heart of Racal's disappointing stock performance was the American modem market. Racal-Vadic, the company's U.S. subsidiary that makes low-speed modems, has been hit by problems with product development and sluggish demand for its pc products.

In 1984, Racal-Vadic introduced an inexpensive personal computer modem. But the pc business stalled and Vadic was left with large stocks of its pc modem, which are now being sold at cost to try to clear the inventory. Development of a new range of modems has also cost Racal dearly. Problems with the manufacture of chips used in these modems delayed their debut for a year and resulted in layoffs of around 150 people at Vadic. These/model troubles also stripped $35 million off the subsidiary's forecast sales.

New ventures have also been straining Racal's resources. Last year, the company set up Racal-Vodaphone to compete in the newly established British cellular radio market, where the firm is in head-to-head competition with British Telecom, the national PTT. The U.K. firm also leads one of the four main projects in the U.K.'s Alvey program on fifth generation research. As part of the project, the company is developing specialized data communications systems for cellular radio.

Communications is Racal's main business in both the military and civilian sectors. The company's other U.S. subsidiary, Racal-Milgo, manufactures data communications gear such as high-speed modems. Its Planet local area network is aimed at both office automation and defense applications. Racal believes the Planet LAN will help it break into the business market. The Miami-based Racal-Milgo had a good year, recording the best results ever. Its computer aided engineering sector also performed well, adding some $30 million to the company's revenues in 1984.

A hint of things to come for Racal comes from its partnership with Norsk Data. The companies are developing a 32-bit Lisp machine for expert systems work.

52

INTERGRAPH CORP.

1 Madison Industrial Park
Huntsville, AL 35807-9985
(205)772-2000

In the field of CAD/CAM systems and computer graphics, Intergraph is the darling of Wall Street, and for good reason. Although the company is 28% smaller (in revenues) than its major competitor, Computervision, its net profit margin of 52% is far better. In fact, its pretax margins, at almost 30%, are more than twice Computervision's 12.5%.

Throughout 1984, Intergraph consistently outpaced Wall Street expectations. Company revenues continued their surge, growing 60% to $403.8 million from $252 million in 1983. Intergraph's net profit was also outstanding, going up 114% to $62.9 million last year from $29.3 million in 1983. Computervision, meanwhile, showed only a modest profit increase and in early 1985 ran into severe financial troubles.

The Intergraph success story is based on several factors, one of which is the niche marketplace in which it competes. Its products are used in mechanical design and manufacturing; architecture, engineering, and construction applications; electronics design and manufacturing; cartography; land use and resource management; energy exploration; facilities management for public and private utilities; and technical publishing. All of these sectors have experienced significant demand for computing power.

Another success factor is that Intergraph, unlike its larger competition, concentrates on software. Computervision has traditionally developed its own hardware as well its CAD/CAM software. Since 1981, Intergraph products have used Digital Equipment Corp.'s VAX superminis, an arrangement that has benefited both companies: Intergraph is DEC's largest oem customer.

In 1984, Intergraph announced several new products that extend the firm's software to the desktop. The Interpro 32 is a 32-bit desktop workstation based on National Semiconductor's 32000 chip. The Unix and MS/DOS workstation is compatible with IBM PCs and Ethernet, and can concurrently emulate up to five DEC VT200, Tektronix 4014, or IBM 3270 terminals.

The Micro II, Intergraph's second major product announcement of 1984, is based on DEC's MicroVAX family of 32-bit processors. It is intended to distribute additional host cpu processing power to the office environment, opening up potential new markets for the firm. The system supports up to four workstations, including the Interpro 32. The Micro II and its workstations operate either as entry-level systems or as nodes on an Intergraph network. Already existing 68000-based Intergraph workstations will be able to connect to the Micro II via a specialized communications processor.

In conjunction with its new product announcements, Intergraph also introduced increased networking capabilities for its VAX-based systems. Its Ethernet implementation is now compatible with DECnet and will allow links to SNA.

53

TANDON CORP.

20320 Prairie St.
Chatsworth, CA 91311
(818) 993-6644

It's amazing the difference a year can make. An oem deal with IBM sent Tandon's revenues skyrocketing 94% to $346.9 million in 1983. Profits that year were up 43% to $27.2 million for the Cinderella company. While not exactly going rags-to-riches-to-rags, 1984 was a different story. Revenue increased only 14.8% over 1983 to $398.5 million. Profits nose-dived 83% to $4.7 million. The company also suffered its first-ever quarterly loss—$724,000 in the fourth quarter. It could just be the first in a series of disappointing quarters.

What happened? The company, which manufacturers floppy drives, Winchester disks, and cartridge tape products in the oem market, says the leveling in net sales resulted from a significant decrease in the growth rate of the microcomputer industry that is served by Tandon's disk drive products. The company also says that competition from the Japanese and others selling into its market has decreased the profitability of disk drive products. But the real competitive battle was over who would supply disk drives to IBM for its microcomputers, and in this bout, Tandon came out the loser.

Sirjang Lal Tandon, president and ceo, summed up 1984 for the company he founded as "a year in transition for the microcomputer industry and Tandon itself." Transition at Tandon took the form of management changes, movement of production offshore, and new product strategies.

Virtually the entire top management changed during the year. Four vice presidents resigned, four new executive officers from inside the company were elected, and some key management responsibilities were shifted.

To meet stiff price competition, particularly from the Japanese, Tandon has moved a large share of domestic production to its Singapore subsidiary. The company's California manufacturing operations were reorganized to produce products based on newer technologies, products less sensitive to price competition.

Tandon is planning a new generation of smaller, higher-capacity, lower-priced memory storage products for microcomputers. These will come to market in 1985 and '86. In particular, the company will address the Winchester hard disk market.

The company spent $16.3 million on R&D in 1984.

Sales in the United States contribute 68% of the company's revenues. Internationally, Europe contributes 4% and the Far East 27% to corporate revenues. Tandon says the company will be aggressively pursuing international sales, especially in Europe, with its newer Winchester products.

IBM's decision to drop Tandon's disk drive will hurt and hurt bad: the contract for floppy disk drives accounted for 58% of Tandon's sales last year. But Tandon management says that it has a letter of intent from IBM saying that Tandon will supply advanced floppy disk technology for such IBM products as the PC AT.

54

TEKTRONIX INC.

4900 S.W. Griffith Dr.
Beaverton, OR 97077
(503) 627-7111

After three very flat years, Tektronix posted a hefty 10% increase in revenues to $1.42 billion in the 12-month period ended last November and a strong 45% rise in real income. Its net profits actually rose by 172% to $131.5 million, but that included a $33 million tax break the company had been accumulating for more than a decade on its Domestic International Sales Corp. Dp revenues, which had remained a flat $300 million for two years, rose an estimated 28% last year to $384 million, attributable chiefly to better-than-expected sales of its graphics color terminals, the models 45115B and 4107 Unicorns.

It seems that everything fell into place at the same time. Three years of painful layoffs that shrank the company's payroll by 3,500 persons to its present figure of 20,600 ended in 1984. In addition, three years of decentralization during which the company established Strategic Program Units—small entrepreneurial groups formed to get technology to the market sooner than the typical two to five years—began to pay off. One of these units, a group using gallium arsendide instead of silicon, this spring became a wholly owned subsidiary called TriQuint Semiconductor Inc. And the adoption of Just in Time inventory techniques to streamline manufacturing has taken the cost of manufacturing down from 51.7% of sales in 1983 to 46.2% this spring. Just in Time techniques also helped reduce a high-volume crt line's cycle to three days from eight weeks just three years ago.

In January 1985, the company began to introduce additional models of its graphics terminals. These included the model 4125 that, with a faster processor and a lower price, will succeed the 4115B. It also introduced the 4128 and 4129, which are three-dimensional graphics devices. This spring Tektronix began shipping a family of microprocessor-based workstations—the series 6000. The workstations incorporate National Semiconductor's 16- and 32-bit chips—the 32032 and 32016. These products originate from Tektronix's Information Display operations, which account for nearly all of the firm's data processing revenues.

With its measuring instruments' sales remaining somewhat flat, the company in January paid $75 million to acquire CAE Systems, a tiny Sunnyvale, Calif., software company with $8 million in sales. CAE Systems designs ways to test, through computer aided design techniques, thousands of electronic circuit elements while they are still drawings on a graphics screen. Tektronix's in-house CAE development program hasn't paid off yet and the acquisition of CAE Systems will hasten its ability to offer these sophisticated CAE testing systems.

The company's breezy and sometimes humorous annual report observes that while the company's earnings had earlier refused to "kick loose" like a "stuck gauge needle," the company is now alive, well, and possessed of "the feisty vitality of early-day Tek."

55

DIEBOLD INC.

818 Mulberry Rd. S.E.
Canton, OH 44711
(216) 489-4000

Diebold holds a commanding 45% share of the 55,000 installed automatic teller machines (ATMs) that last year performed some 3.4 billion transactions. This was achieved despite intense competition from such giants as IBM and NCR.

Its 1984 earnings of $56.9 million on revenues of $474 million were an increase of 16% over 1983 but were also down from the previous year's rise of 18%. Dp revenues were $374.1 million in 1984. The company boosted R&D spending 43% to $12 million from $8.5 million the year before. Much of the research funds and an acquisition were aimed at allowing Diebold to say "thanks to the banks" and search out other markets, specifically the retail environment. It now is offering products to automate transactions at supermarkets, convenience stores, and gas stations. Last fall it bought Retail Terminal Systems Inc., a Hudson, Mass., manufacturer of electronic cash register and payment terminals that are aimed at the convenience stores and petroleum industries.

Now that most banks have ATMs, president and ceo Robert W. Mahoney sees the company's greatest growth to be in "added value services" to holders of the 100 million ATM debit cards in circulation. His predecessors brought the company out of safes and vaults and into ATMs; Mahoney, who joined the company three years ago after 21 years in sales and executive posts at NCR, is bringing Diebold into the retail environment.

Mahoney feels that once the preferences for different systems have been sorted out, the market for self-service money transaction systems (or electronic funds transfer systems, as they're often called) will grow substantially. "Today, there are approximately 245,000 convenience stores and gasoline stations . . . ideally suited for self-service EFT devices," Mahoney says. Last January, the company received a substantial order from National Transactions Systems to place a total of 1,000 Diebold cash-dispensing machines in 7-Eleven convenience stores and Safeway supermarkets on the West Coast.

In addition to its acquisition of Retail Terminal Systems, Diebold last year added three features to its automatic transaction systems and formed a third-party service business to provide maintenance of all EFT and computer industry electronic systems, such as teller terminals, modems, multiplexors, controllers, and mini and microcomputers.

56

MOHAWK DATA SCIENCES CORP.

7 Century Drive
Parsippany, NJ 07054
(201) 540-9080

"MDS has an auspicious future. We've made the decisions, consolidated and redirected our resources, and are now poised for growth and profitability through the '80s and beyond." So wrote MDS chairman and president Ralph H. O'Brien in the firm's annual report last July. His words have not exactly proved prophetic.

In fact, 1984 turned out to be a thoroughly rotten year for MDS. While most of the firm's trauma was precipitated in the second half by New York-based investor Asher B. Edelman, the initial trouble was self-inflicted, beginning late in 1983. The systems division's key new products for that year flopped, and in the quarter ending January 1984, earnings tumbled 84% over the prior year. The following quarter saw Mohawk's first loss, a $59.7 million decline that was more than 10 times larger than any quarterly gain in several years. For the full year ending Jan. 31, 1985, Mohawk lost $120.9 million, while revenues dipped 5% to $381.7 million. Gross margins on sales fell about 10 percentage points, while rental and service margins dropped about two points.

Neither of Mohawk's dp divisions fared well. The systems division spruced up its line with the Hero intelligent workstation, a version of Convergent Technology's N-Gen. Chip shortages and incompatibility with IBM systems crippled Hero before it could gain momentum, however, and the division has yet to recover.

The Qantel division, while continuing to introduce vertical market systems based on its successful line of minis, spent much of its time in court. National Surety Corp. sued Quantel to recover a $5.5 million bond in connection with litigation filed by a former distributor, and a former sales rep filed a $15 million suit charging breach of contract, conspiracy, and fraud. Quantel reached out of court settlements in both cases. Early in 1985, Quantel president Dallas Talley organized a group of investors and put up $200 million to buy the division, but was rebuffed.

As if Mohawk's internal problems weren't enough, Edelman provided additional impetus. Fresh from dismantling Management Assistance Inc. and not yet ready to take on Datapoint, Edelman bought about 8% of Mohawk's stock and moved to gain operating control of the company. By October, O'Brien had stepped down and Edelman took over. Simultaneously, Mohawk was able to work out a new accord with its banks, a necessary step, since it had not satisfied certain net worth agreements stipulated in earlier covenants. The ironic postscript to Edelman's takeover came in March 1985, when Edelman himself stepped down as president and resigned his seat on the board because his role at Datapoint represented a conflict of interest. Turnaround specialist Matthew E. Tutino replaced him in both slots, and also was named to the new position of Quantel chairman.

57
CONVERGENT TECHNOLOGIES INC.

2500 Augustine Drive
Santa Clara, CA 95054
(408) 727-8830

T.S. Eliot wrote that April is the cruelest month. For Convergent Technologies Inc., all of 1984 might well have been April. The firm posted revenues of $361.7 million for the year, more than double the $163.2 million shown for 1983. While revenues doubled, earnings went through the floor. The problem was a fourth-quarter write-off of $14.5 million, which caused a yearly loss of $13.8 million versus the $14.9 million profit in 1983. A combination of hyperbolic management practices, dud product, and bad luck made for the gloomy weather that swirled around Convergent as the year ended.

A modest, mimeographed, seven-page handout told part of the story: a write-off of $3.4 million for pricing adjustments and hardware returns, with another $7.4 million charged off to inventory variance and excess. In plain English, Convergent was dumping its entire WorkSlate laptop micro line.

Another $3.9 million was shown to cover recruiting and the awarding of a bonus to new ceo Paul Ely Jr., whom one observer of Convergent likened to flotation gear for a sinking ship. Part of that sum, by the way, was also a separate bad debt provision. Yet another $2.4 million was attributed to items that included a canceled bond offering and loss on building disposal.

One headache with which Convergent at last came to grips was its MegaFrame, which functioned poorly in Unix-type multiprocessor configurations until the bugs were ironed out. Likewise, the company has taken a more realistic pricing attitude toward its N-Gen workstation. Here, the company had angered customers by setting one price and then being compelled to go back with new prices after discovering that it simply took more money to build the product than Convergent had first assumed.

As the year closed, speculation had it that Convergent's fortunes would improve when AT&T Information Systems released its Unix pc, which Convergent has been building as the 7300 voice/data workstation. Convergent is said to be building 50 of the machines each day under what could be a $200 million contract. Management estimates that Convergent will be doing $300 million annually in business with AT&T-IS by 1987.

Ely says that after he completes his program of corporate reorganization, Conver-

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58
MARTIN MARIETTA CORP.

6303 Ivy Lane
Greenbelt, MD 20770
(301) 982-6500

Martin Marietta means defense and aerospace business, but the brightest star in Martin Marietta's 1984 galaxy was neither of those stalwarts. It was Martin Marietta Data Systems (MMDS), the company's fastest growing business segment. Last year, Data Systems split in two, acquired a systems software provider, and achieved record sales, profits, and backlogs.

Data Systems has averaged a 25% growth rate over the past five years. Last year was even better. Total revenues jumped 134% to $361.5 million from $154 million. And the division entered 1985 with a $300 million backlog of orders.

The success was apparently too much for one entity to handle, so MMDS cut itself in half. The Information Technology division's job is to bring together software products and related services for commercial markets and facilitate internal application development. The Systems Integration division focuses on the multimillion-dollar business of integrating large-scale computer systems and the on-site management of computer operations, primarily in the federal marketplace.

That division hit a home run its first time at bat. Under a $185 million, 10-year contract, the company will provide the Navy with an automated worldwide personnel/payroll system.

The Information Systems division hit a grand slam early in 1984. It won a $684 million contract from the Department of Transportation to provide engineering and overall integration of the systems and technologies necessary for the Federal Aviation Administration's 10-year, $10 billion National Airspace System Plan.

Much of this year's success was based on the performance of Mathematica, which Martin Marietta acquired in 1983. The Princeton, N.J., company developed RAMIS II, one of the industry's leading fourth generation software systems. That product hit the $100 million mark in cumulative sales in 1984. RAMIS II even went international, offering RAMIS II Français as a natural language interface to RAMIS II and other databases.

While MMDS was the brightest spot in Martin Marietta's balance sheet, the company as a whole also had a presentable year. Sales increased slightly, up .05% to $3.92 billion from $3.89 billion, leading to an 35.7% increase in net income, to $191.8 million from $141.3 million.

59
THORN EMI PLC

Sunbury House
79 Staines Rd. W.
Sunbury-on-Thames
Middlesex TW16 7AH, England
(44-962) 5444

Better known for light bulbs, the Beatles, and British films, the Thorn EMI electrical appliances and leisure group has recently been making inroads into the dp domain. In less than three years the company has built up the $346.7 million (£260 million) Thorn EMI Information Technology division mostly through acquisitions. Thorn EMI Information Technology now accounts for about 10% of the group's total sales.

With the $11 million purchase of financial modeling specialist EPS Consultants earlier this year, Thorn EMI now claims to have the largest independent software house outside the U.S. Thorn EMI Computer Software has sales of over $50 million and plans to expand in the U.S. using EPS Consultants' distribution network. Also in the states, it has established TECS Inc. to sell software.

Overall, Thorn EMI's computer interests grew by over 25% in local currency during

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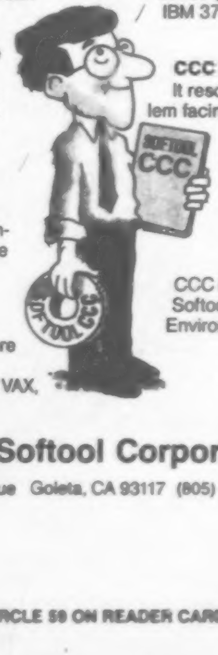

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CIRCLE 59 ON READER CARD

1984, compared to the 29% growth rate of the previous year. In addition to its computer software division, Thorn EMI also owns Software Sciences and Datatech, which manufacture data recording and communication equipment. The company also has interests in the areas of computer maintenance, engineering, and telecommunications.

The proliferation of companies in Thorn's information technology division has resulted in yet another reorganization. This year the 14 operating companies that make up the division were grouped into five sections—systems, processing services, business systems, data equipment, and protection and control.

One of Thorn EMI's most surprising moves last year was the $133 million purchase of British chipmaker Inmos. Beating off a bid from AT&T, Thorn bought close to 76% of the company.

60

MANNESMANN KIENZLE GMBH

Postfach 1640
D-7730,VS-Villingen, West Germany
(49-7721) 861

The West German Mannesmann group was relieved to see a turnaround in its Kienzle electronics subsidiary last year. After reporting losses early in the decade, the company, now called Mannesmann Kienzle to reflect its integration into the group, just about broke even in 1983 and finally made a small profit in 1984.

Dp revenues reached $343 million (DM977.5 million), a 21% increase in terms of local currency. The company showed continued expansion of its business in West Germany and elsewhere in Europe.

The fastest growing part of the company is the Mannesmann Tally printer operation, which recorded a 35% boost in business last year. Indeed, this was the best year ever for printer sales, with orders reaching 167,000 units. This compares favorably with 1983's total of 92,000.

The data systems side of the firm, which accounts for the largest share of the revenues, grew by roughly 20%, thanks mainly to the company's new 9100 minicomputer. First shown at 1984's Hannover Fair, the mini contributed 75% of the division's annual revenues.

The 9100 also had a big impact on the company's export business. In 1983, 60% of Kienzle's sales were derived from West Germany. Last year the situation was completely reversed, with 60% of sales coming from outside Kienzle's home market. Those export revenues were strongest in France and Britain, where the company has been established for many years.

The 9100 mini system also did well in Austria, the Netherlands, Belgium, and Spain, where the market for dp wares, especially at the lower end of the product spectrum, is expanding rapidly.

Many of those 9100 system sales were in the financial sector, where Kienzle is making a name for itself with the banks and credit companies. The mini also scored points with medium-sized companies and smaller firms with ambitions for the future.

To expand that customer base even further, Kienzle must come up with a bigger product portfolio. This year the company plans to pump $10 million into research and development of hardware. Another $20 million will go for such things as development of new software products, the training of personnel, and the hiring of 150 more salespeople. Kienzle also plans to put $10 million into new manufacturing facilities and offices.

61

COMPAQ COMPUTER CORP.

20555 FM 149
Houston, TX 77070
(713) 370-0670

Few fairy tales begin in Houston, but the storybook rise and continued success of an IBM PC clone company continues to astonish. After ringing the cash register bell to

Clearing Winter Storm, Yosemite National Park, California 1944. Photography by Ansel Adams. Courtesy of the Ansel Adams Publishing Rights Trust. All rights reserved.

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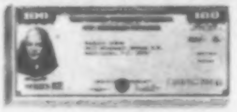

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CIRCLE 78 ON READER CARD

the tune of $111 million in 1983 revenues, Compaq's fortunes soared again in 1984. Sales of $329 million moved Compaq to the forefront of the personal computer industry, only steps behind market leader IBM.

Compaq began as an idea conceived over a cup of coffee at a local Houston restaurant, and in 1983 three Texas Instruments employees delivered the world's first portable computer that was as IBM PC-compatibile as the lawyers would allow. Its success that year was due in part to the inability of IBM to meet delivery schedules and Compaq's efforts to recruit and cultivate a devoted dealer network. The company's 25 pounds-plus luggable computers gave new meaning to the phrase pumping iron.

Success in 1984 had a similar origin—when IBM couldn't meet demand for its high-performance PC AT model, Compaq's recently introduced tabletop version, the DeskPro, picked up the slack. Indeed, marketing surveys indicated that last year Compaq sold more DeskPros than IBM sold PC ATs. The company is estimated to have shipped about 139,000 portables and desktop models last year, about a tenth of IBM's production.

Compaq grew to corporate adolescence by proving it was more than a one-product company. Following up its DeskPro success, Compaq introduced an integrated voice and data personal computer in early 1985 into an increasingly crowded and uncertain market. R&D spending soared to $11 million, as the company moved to expand its product line.

The Houston fairy tale does have a happy ending, as earnings practically tripled during 1984 to $12.9 million. If there is a witch on the scene its the Wicked Witch of the East (in Armonk) with its price umbrella. Compaq's profit margins are razor thin, and getting thinner, due partly to the curse of IBM's aggressive pricing strategy. But if the other dwarfs of the IBM PC-compatible business fall into the abyss, Compaq may be able to raise prices and take out a long-term lease on the yellow brick road.

62

SEAGATE TECHNOLOGY

920 Disc Drive
Scotts Valley, CA 95066
(408) 438-6550

Seagate was flying high until midyear, when revenues plummeted 50%—a consequence of IBM's decision to cut orders for the Winchester disk drives that go into its microcomputers. But despite Seagate's troubles, it was the only supplier of Winchester drives to IBM that remained profitable.

Seagate's net sales for the first half of calendar 1984 were nearly $201.6 million; sales for the final half were $102.4 million. Nonetheless, Seagate ended calendar 1984 with revenues of $304 million, compared

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(313) 649-5210
In Canada
Associated Telephone Industries Inc.
(604) 271-3988

with last year's $222 million. Income for the first half was $23 million; for the second half it was only $807,000, bringing income for the calendar year to $23.8 million, 19.6% less than last year's $29.6 million.

Seagate, which developed and shipped the first 5¼-inch Winchester disk drive in 1980, has become the leading independent manufacturer of these drives. The company built its business on customers like IBM, which uses Seagate drives in its PC XT.

Personal computer manufacturers, confronted with low demand for their products and excess inventory, cut back on disk drive orders in 1984. When IBM failed to order Seagate drives, Seagate lost its biggest customer. IBM's policy of never paying more than it has to, as well as competition among disk drive manufacturers, contributed to plunging prices for Winchester disks—a 10 million-character disk that went for $450 in early 1984 cost only $300 in 1985. To cut costs Seagate laid off 800 employees and shut down a domestic plant, sending the bulk of its manufacturing offshore to Singapore.

The light at the end of the tunnel was the hope that IBM would turn to Seagate as a supplier of disk drives for its PC AT, and Seagate finally reached the light when IBM placed a $200 million order in March 1985.

Seagate has signed an agreement to acquire Grenex Inc., a producer of thin-film media. This thin-film, or sputtered, medium is a disk coating that provides greater storage density. Grenex's media are still in the R&D stage, so production will not ramp up for another year or so.

New products introduced during the year included a 3½-inch 10MB drive, a 5½-inch half-height 20MB drive, and a full-height 40MB drive.

63
BASF

Gottlieb-Daimler Strasse 10
6800 Mannheim 1, West Germany
(49-621) 4008

Fifty-one years ago, German chemicals giant BASF invented a form of storage that has been the mainstay of the dp industry—magnetic tape. In fact, the company is still among the leaders in the magnetic media field. These media products coupled with European revenues from Hitachi mainframes resulted in dp revenues of $298.2 million (DM850 million), a 21% increase in local currency.

While some parts of the pcm business may be on the rocks in the U.S., IBM-compatible mainframe supplier BASF in Europe had smoother sailing last year. BASF got $134 million of its $298.2 million dp revenue from sales of Hitachi mainframes and peripherals. Most of those sales came from Germany, the U.K., and France. Claiming to be the number one pcmer in Europe, BASF had more than 300 mainframes and over 20,000 peripherals installed at the end of last year.

BASF also considers itself to be the fastest growing European pcm, since it's installed more plug-compatible systems than anyone else. It has, after all, been a European pcm supplier longer than Amdahl or National Advanced Systems, and Olivetti sells only Hitachi mainframes in its home market of Italy. The growth in BASF's dp trade meant the company had to hire 200 more employees on the data side last year. Sales of its new 6480 disk system, which is equivalent to the IBM 3380, were particularly strong. BASF was the first European pcm to hit the market with a 3380-type system. By the end of last year it was installing 400 gigabytes of capacity a month.

Last year the company introduced support for XA on its 7/75 and 7/88 models, which are based on the Hitachi M260 and M280 machines, respectively. It also upgraded the power on its IBM 4381 level 7/69 machine, which is based on the Hitachi M240H. BASF's answer to the IBM Sierra announcement was also unveiled earlier this year.

On the media side, which accounts for 55% of the company's business, BASF marked its half a century in the magnetic tape realm by putting its current R&D activities on the line. After entering the thin-film disk market, it is now working on new density techniques for floppy disks that would greatly increase capacities. It's also working on high-density chromium dioxide cartridge tapes and magneto-optic technology that BASF believes will be the optical storage technique for the next 10 years.

BASF's current line of media products fared well in 1984, especially in the floppy disk market, where the pc boom significantly spurred sales of the company's FlexyDisk. Around $40 million of the company's media revenues came from its U.S. arm, BASF Systems Corp., in Bedford, Mass.

64
PLESSEY CO. PLC

Vicarage Lane, Ilford
Essex 1G1 4AQ, England
(44-1) 478-3040

Like many established British dp firms, Plesssy is finding the '80s tough going. A heavy investment program and poor overseas performance contributed to lower profits for the U.K. telecom company. The System X digital telephone exchange, which was developed in partnership with Standard Telephones & Cables and GEC, also clouded the profit picture.

The dp sales scene was much brighter. At the end of last year Plessey's dp revenues hit $290 million (£217.5 million) an increase of 14.8% in local currency. On the dp front, Plessey launched a 256K business computer at the beginning of last year. This system ties in with the company's Integrated Business Information System (IBIS), which includes the IDX digital PBX and various workstations.

Things were bleaker from a peripheral point of view. The British company's peripherals division has not turned a profit for the past three years.

The sharpest thorn in Plessey's side comes from the telecom business, where profits are down over 10%. The chief culprit is the System X digital exchange that was commissioned by British Telecom. The switch, which cost Plessey $100 million to develop, has still not generated much revenue. Production delays on the switch resulted in a $6 million loss.

What's worse is that although System X scores high marks in the competitive world of digital exchanges, Plessey still has little prospect of sales outside the U.K. In a bid to broaden its appeal, Plessey is working with its U.S. subsidiary Stromberg Carlson to produce a U.S. version.

Stomberg Carlson itself is proving troublesome. Despite Plessey's pouring $30 million into the firm last year, with an additional $36 million in the current year, Stromberg remains a drain on Plessey. The British parent is hoping to revitalize Stromberg by bolstering its product line with some of Plessey's U.K. wares.

65
RICOH CO. LTD.

Ricoh Building
15-5, Minami-Aoyama 1-chome
Minato-ku, Tokyo 107, Japan
(81-3) 479-3015

Using steady domestic and overseas sales of standalone facsimile and copier equipment as its mainstay, Ricoh continues to diversify into office automation products. DATAMATION estimates Ricoh's sales of data processing equipment increased about 30% in 1984 to $290.1 million (¥68.9 billion) and accounted for almost half of overall sales growth. The Japanese domestic market absorbed most of Ricoh's Japanese language word processors, and office computers. Overseas oem arrangements increased demand for Ricoh's printers, teletex equipment, and pc components.

Ricoh came out of nowhere in 1984 to take the number three position in the Japanese word processor market. The Ricoh sales network in Japan is the envy of Japanese dp giants. While Hitachi Ltd. designed and produced Ricoh's Japanese language word processing system, Ricoh markets and distributes it because its 4,000 retail outlets in Japan are backed up by a network of 40 wholesalers and distributors.

An oem agreement to supply high-speed facsimile equipment strengthened Ricoh's relationship with AT&T Information Systems in 1984. Ricoh also oems pc boards to Convergent Technologies. Steady moves into the pc oem market during 1984 are part of Ricoh's plans to become a supplier of pc/integrated workstations. As the result of negotiations during 1984, it looks as if Ricoh is hoping to market AT&T Information Systems' office automation equipment in Japan. Ricoh is reportedly seeking out foreign partners to provide products and software solutions for the intensely competitive domestic market for office systems.

During 1984, Ricoh consolidated its American marketing network by merging Ricoh of America and Rapicom Inc. to form Ricoh Corp. This move further strengthened Ricoh's stateside distribution and service network and put the firm more in tune with the product needs of its biggest overseas market. Tie-ups with American and possibly European allies are likely to continue through reciprocal oem arrangements that show Ricoh how to better blend its products into integrated office automation systems also required in a maturing Japanese market.

66

PARADYNE CORP.

8550 Ulmerton Rd.
Largo, FL 33540
(813) 530-2000

While waiting for decisions on the Securities and Exchange Commission and related lawsuits, Paradyne in 1984 decided to go to work and make some money. Revenues zoomed 39% over the previous year, to $289.9 million, and net earnings tripled 1983 levels, reaching $11 million. While those profits are no better than what the company posted in 1980, they still represent a promising turnaround from its dismal performance in 1983.

Paradyne's two-year battle with the SEC over allegations that the company used fraudulent practices in obtaining a $100 million contract with the Social Security Administration will finally be decided in federal court this month. Management, which has always contended the charges were unfair, has learned to cope with the distractions of litigation and the pain of a $1.2 million bill for legal fees, and has turned its attention to business.

"The company has been engaged in expanding and strengthening its marketing and service organization," says Robert S. Wiggins, Paradyne's chairman, president, and ceo. He cites that emphasis and the success of the MPX modems and DCX multiplexors as the bases for the strong revenues.

Among the new products introduced during the year were the very high speed VHS modem, which combines with the company's MPX series to form a full line of advanced signal processing modems; the 9403 protocol convertor; and an enhancement of the PIX/PIXNET product line. Investment in research and development was increased. And though its one-year backlog of unfilled orders was down, the company attributed this to "the significant increase in products shipped during the year as well as the compressed order/delivery cycle."

Despite unimpressive income figures from overseas subsidiaries, and a recommendation from a congressional committee that Paradyne be provisionally barred from future government contracts, analysts are bullish. They point to strong company management and a weak government case as cause for optimism. Indeed, color has returned to the cheeks of Paradyne stock, with earnings per share rising to 49 cents in 1984 from 16 cents the year before. To start 1985 off right, the company announced a three-year oem agreement with BellSouth Advanced Systems Inc., a subsidiary of South Central Bell, to distribute Paradyne modems and multiplexors in the Southeast.

67

3M

3M Center
St. Paul, MN 55144
(612) 733-1110

In 1984, 3M oversaw a far-flung conglomeration of more than 100 generally autonomous operations, grouped into 39 divisions, and sold a staggering 50,000 different kinds of products.

Revenues rose 9.4% to $7.71 billion in 1984 and profits pushed up 10% to $733 million. DATAMATION estimates 3M's dp revenues grew about 8% to $281.4 million—a tiny speck in this vast organization that some old-timers at the St. Paul world headquarters still refer to as "the mining company." Nonetheless, dp activity was not without exciting breakthroughs, and some parallel disappointments.

In the computer memory media business, which accounts for most of 3M's dp revenues, the company began to ship test models of its erasable laser-based optical disks. It also intensified research into what it calls "stretched disks," and in early 1985, began producing samples of the devices for testing by computer manufacturers. The new disk consists of a flexible magnetic material that is stretched and bonded to a rigid substrate made of polyethermide. The result is a hybrid of a floppy and a Winchester rigid disk and is expected to threaten Winchester media.

A disappointment to 3M was its new electronic document transmission system, the Whisper Exchange. After only a year on the market, it was dropped for lack of customer interest. Also, the computer output microfilm (COM) operation, where 3M has held a dominant position for more than a decade, was declared a "marginal product line," and was sold off to Bell & Howell. 3M took a one-time $12 million write-off on this divestiture.

The company, however, continued its steady sell of products in the micrographic area with its Microprint II system for filing and retrieving microfilm documents. Recently introduced software for document storage and retrieval operates on an IBM 4300 computer, under two operating systems.

Last year, 3M spent $43 million for research and development, a 15% increase over 1983. One of its better known research projects was a series of experiments in earth orbit aboard the Discovery space shuttle to grow crystals in near-zero gravity. It plans further experiments this year and well into the 1990s. It has also started development on a research center in Austin, Texas, that in five years aims to employ thousands on a 150-acre complex.

If the company has a problem, it is the stiffening price competition for videocassettes and computer floppy disks. In response to these pressures, 3M's Memory Technology Group fought back last year: it matched prices with Verbatim, a unit of rival Eastman Kodak and a leader in the memory market.

Another change came inside the Information Systems Group, which sells microfilm retrieval products, and copier and facsimile equipment. Last year 3M stepped up its efforts to diversify distribution channels for these products. More than 80% of the copiers and fax machines are now being sold through business equipment dealers, compared with 20% two years ago.

68

MITEL CORP.

350 Legget Dr.
Kanata, Ont. K2K 1X3, Canada
(613) 592-2122

So far, Mitel has been unable to recapture the ground it began to lose back in 1982. Then it was king of the small PBX realm. The company had actually doubled its sales every year since 1977 and earnings had tripled from 1976 to 1981. During 1984, Mitel's revenues grew by 15% to $277.4 million ($C365 million). Earnings haven't been announced, but were expected to be better than the loss of $32 million chalked up in 1983.

Aiming at the highest end of the PBX market, Mitel plowed much of its cash into developing the mighty SX-2000. The switch, however, has yet to benefit the firm's bottom line.

Originally scheduled for delivery in mid-82, the switch was stalled due to production problems and software snags. The delays also cost Mitel valuable contracts with big corporate customers and the Bell operating companies. The SX-2000 struggle also reportedly scuttled the company's 1983 deal with IBM.

The U.K. became the first country to receive the SX-2000. Mitel is focusing its marketing efforts on Britain, which accounted for half the firm's SX-2000 orders in '84. The Canadian company has important U.K. distribution deals with British Telecom and ICL. Mitel's PBX pact with ICL, however, may be tenuous following the Standard Telephones & Cables' buy into the U.K. mainframer last year.

Back in the U.S., where customers first got their SX-2000 switches in July, business was slower. There is no doubt that the delivery delays and IBM defection to Rolm have tarnished Mitel's image in the States, paticularly on Wall Street. Mitel's piece of the PBX pie has steadily been shrinking. The company, which had an 11.6% share of the U.S. switching market in '83, is expected to have only a 10% stake by 1988.

The 12-year-old company has also been bedeviled by management problems. Last year almost a dozen executives, including chief operating officer and executive vp Donald Gibbs, fled the firm. Turnaround specialist George H. Gilmore was brought in to head operating planning and to implement cost-cutting measures, among them laying off workers and closing plants.

69

FERRANTI PLC

Bridge House, Park Road, Gatley
Cheadle, Cheshire, England
(44-61)428-3644

Ferranti has been a family affair ever since founder Sebastian de Ferranti set up the original company in 1882 and opened up the world's first power station in London. One of Britain's foremost defense contractors, the firm is now branching out into new markets and new lands.

Last year Ferranti bought Houston-based TRW Controls Corp. for $10 million, rechristened it Ferranti International Controls, and has plans to repeat the exercise with other acquisitions. The TRW takeover is important for Ferranti because it moves the British defense contractor further into the commercial dp domain. Instead of offices and factories, Ferranti's own Argus systems, manufactured by Ferranti Computer Systems, are more likely to be found on board warships and in weapons systems.

On the whole, 1984 was a good year for Ferranti. The group reported good profits while the dp business grew to $266 million (£199.5 million), a rise of 36.2% in pounds sterling.

Ferranti Computer Systems has reshaped its executive team to give more edge to its commercial business. Managing director Peter Dorey has hinted that he wants to move away from defense business probably by buying a U.K. company with the right commercial know-how. At present Computer Systems sells word processors, pcs, process control systems, and a handheld market research terminal.

Last year the company brought its office automation systems to market at the office automation show in London. The Argus range of office products includes an intelligent terminal cluster controller called the Interactive Terminal Manager (ITM). This links to IBM and ICL mainframes to offer personal computing, and the multiwindowing vdu gives concurrent access to a number of separate mainframes or minis. Ferranti also began selling two message switching systems and a word processing package based on a U.S. system from Syntrex.

Meanwhile, in the U.S. Ferranti formed a close development link with expert systems firm Inference Corp., and is now its sole European distributor of the Inference Lisp-based Automated Reasoning Tool.

The British company also decided to take its CAD/CAM expertise across the ocean and set up an office of Ferranti Infographics in Huntington Beach, Calif. Earlier in the year the company had won one of Europe's biggest ever CAD/CAM orders from British Royal Ordnance Factories.

70

SANDERS ASSOCIATES INC.

Daniel Webster Highway S.
Nashua, NH 03061
(603) 885-4321

At first glance, everything at Sanders looks dandy. Total corporate revenues of $837.7 million for 1984 reflect a 29% increase over '83 revenues of $648.8 million. Dp revenues were up almost 25% to $260.8 million.

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All that sounds fine. But net corporate income for Sanders was down 7% in 1984 to $39.7 million. Officials blame high initial manufacturing costs and delays in some major programs. Sanders also had to contend with unexpectedly high nonrecurring costs on a number of smaller programs.

But there was good news, too. Sanders' government business, amounting to about 60% of its total revenues, was healthy: funding continued on major programs, and, overall, government systems and products sales volume, profit, and order backlog continued to increase.

Another bright spot was CalComp, Sanders' computer graphics company. Revenue and profit increased, led by strong acceptance of the graphics display product line by oemers. The plotter, digitizer, and CAD systems product lines also showed revenue and earnings improvements. Sanders and CalComp are pinning a lot on two newly introduced plotters, particularly the comparatively low-priced Model 1040.

In the turnkey CAD market last year, sales doubled for CalComp's architectural, engineering, and construction segment. The year 1984 also saw the introduction of the Unix-based CalComp System 25. The new line offers standalone workstations, networking for distributed applications, and configurations that directly interface with larger host computers such as VAX.

Sanders officials say they are optimistic that the second half of 1985 will be an improvement over 1984 and the first half of 1985. They say the rest of the year will bring "favorable earnings momentum" and continued revenue growth.

71

BOEING COMPANY

P.O. Box 3707
Seattle, WA 78124
(206) 655-1131

The economic recovery of 1984 and the current administration's penchant for buying aircraft and weaponry buoyed Boeing's sales in 1984. The company's 10% increase in profit over 1983—to $390 million—was also boosted by a DISC windfall, which pushed its net up an astonishing 121% to $787 million. Meanwhile, Boeing posted a 7% decline in revenue to $10.35 billion, which was largely caused by reduced sales to the government. The problems that also dog some commercial airlines plus the strength of the dollar abroad depressed Boeing's sales in commercial and foreign sectors.

DATAMATION estimates that Boeing Computer Services (BCS) took in about $260 million in outside revenue, a 4% increase over last year. Boeing is no stranger to the perils of providing timesharing services in an age of cheap micros, but the firm has been insulated a bit from the traumas felt by other timesharing vendors because its services are scientific in nature, not commercial. Since supercomputer prices have not yet fallen to the point at which many companies can buy their own, BCS's timesharing supercomputers are still in demand.

The organization continued its shift away from its traditional computer services and toward networking, computer aided design and munufacturing (CAD/CAM), microcomputers and workstations, and training. In January, BCS introduced its first commercial network services. It also won a five-year, $200 million telecommunications contract from NASA, and a $19 million contract for a communications network from the Commonwealth of Pennsylvania.

With the far-off world of factory automation suddenly close at hand following General Motors' promotion of the Manufacturing Automation Protocol, Boeing saw a potentially lucrative market for which it is ideally situated, as the primary dp arm of a highly automated corporation. At the National Computer Conference, BCS joined with GM and a host of other vendors to demonstrate a multivendor network using Open Systems Interconnect (OSI) technology.

BCS has continued to develop new technologies internally. The organization estab-

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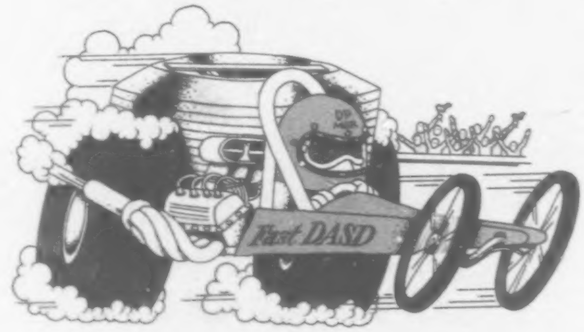

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DAAD

CIRCLE 67 ON READER CARD

lished its own artificial intelligence center and is also working with Carnegie Group Inc. of Pittsburgh on research into AI, expert systems, voice recognition, machine vision, and robotics. Through these technology areas, as well as through MAP and the diversified products it introduced last year, Boeing believes it can transform itself from a processing services vendor into a more competitive force in more sectors of the market.

72

SHARED MEDICAL SYSTEMS CORP.

51 Valley Stream Pkwy.
Malvern, PA 19355
(215) 296-6300

SMS continued to increase revenues and earnings despite mixed financial signals from the health care industry in 1984. The company has the biggest piece of the market for hospital information systems in the U.S. and is also doing business in the U.K., Ireland, the Netherlands, Spain, West Germany, Canada, Japan, and Puerto Rico.

Hospitals are faced with federal regulations on medicare reimbursement rates, and with competition from health maintenance organizations (HMOs), freestanding emergency rooms, and one-day surgery centers. In response, hospitals' demands for information systems are rising, as are SMS's revenues. Climbing 22% from 1983 figures, SMS's revenues increased to $256.8 million, while net income jumped 24% to $33.8 million. Analysts have predicted this success will continue: Kidder Peabody recently estimated the company will grow more than 20% annually for the next five years.

During 1984, SMS saw an increasing interest in all application areas including financial, patient care, and database management systems. An important addition to SMS's clinical system offerings is the Tumor Registry, an application that automates the registration and monitoring of cancer patients. The year 1984 also saw SMS expand the role that pcs play in the hospital information network. Nurse Staffing and Medicare Cost Reporting are two examples of new pc applications developed by SMS.

73

M/A-COM INC.

7 New England Executive Park
Burlington, MA 01803
(617) 272-9600

M/A-COM Inc. bounced back in 1984 from a period of turmoil. In 1983 the widely diversified communications company had looked as though it might be suffocated by excessive growth, all of it from acquisitions.

Leaner and meaner after shedding two businesses and consolidating 21 operating companies into eight in 1983, the mini-conglomerate began to make money again. It posted a 21.8% increase in 1984 revenues, a 31.7% climb in profits, and its stock, which had languished at around 14 or 15, was being traded for $25 a share early this year.

Growth in 1984 consisted only of new business orders—no acquisitions, no divestitures, no reorganization. The growth contrasts sharply with the year earlier when revenues were flat, rising only 7% from the year before, and when profits actually dropped and dp revenue was unchanged.

This year, M/A-COM's integrated digital businesses—which account for all of its dp revenues—posted a 25% gain, taking in $250 million, compared with $200 million in 1983. That operation is about even with two other top revenue producing operations—microwave components and cable and home television—but it is growing the fastest: 30% to 40% a year, and the company claims it will continue that way through 1990.

Judging from some of its current big orders, the claim may be justified. It has a $20 million contract to provide earth stations and signal-processing capabilities for Schlumberger's oil exploration satellite network; a $20 million to $30 million order from GTE for similar products for GTE's Spacenet network; a $20 million order to provide systems for the Argo private satellite network; a $16 million order to hook up 300 Southland (7-Eleven) Corp. branches in a satellite network; and a $6 million contract to connect 750 stores in the Wal-Mart retail chain. These orders were part of an estimated $280 million worth of contracts the operation received in 1984 for satellite communications systems.

The company was known as Microwave Associates until the late 1970s when it began an acquisition campaign that, in the five years from 1979 to 1984, tripled its revenues to $768 million from $227 million.

74

PERKIN-ELMER CORP.

761 Main Ave.
Norwalk, CT 06859
(203) 762-1000

The Data Systems Group, Perkin-Elmer's only dp division, recorded strong sales and order growth throughout 1984, and in early 1985 introduced several new products designed to take the firm through the next several years. The group's revenues, all from the 3200 supermini line and related products, grew 11.1% during the year to $250 million. (By comparison, corporate revenues grew 12.4% to $1.26 billion while net income was up an impressive 27.4% to $66 million.)

Moreover, orders for the Data Systems Group have been growing at better than a 20% clip, and reached record levels by year-end. Concurrently, the firm has cut costs and streamlined the group's operations, helping to restore pretax margins. Still, the current margins of about 7% are well below the division's 1980 record of over 11%.

The Data Systems Group is the heir of Interdata, which a decade ago introduced the first 32-bit supermini. Since being acquired and renamed, the group has confined itself to the supermini market. Indeed, in the past few years, the division has concentrated even more narrowly, appealing primarily to the scientific and engineering users already familiar with the P-E name from the firm's analytic instrument, semiconductor, and optical products groups. The division also makes storage and communications peripherals for the 32-bit engines.

By focusing on the scientific and engineering users, with their needs for very powerful processing engines, the company has built a reputation as one of the supermini market's speed kings, competing with Gould and Harris to sell the fastest superminis. In early 1985, P-E topped off its 3200 line with the 3260MPS, a multiprocessor system capable of 5.5MIPS in a tightly coupled seven-processor configuration. The new product can communicate with other 3200 series boxes via the proprietary PENnet. Perkin-Elmer also introduced the low-end 3203 system and advanced features for its Reliance Plus DBMS. The new Reliance Star product enables remote 3200 systems to share the same database, in effect becoming a single, distributed database machine.

Despite the new products, analysts and customers are worried that Perkin-Elmer may abandon the high end of the supermini market. They note that P-E is still the only vendor exclusively using TTL technology, and that the uniprocessor performance of the 3260 engine is significantly slower than boxes supplied by Gould, Harris, and even commercially oriented vendors like DEC

75

ZENITH ELECTRONICS CORP.

1000 Milwaukee Ave.
Glenview, IL 60025
(312) 391-7000

Data processing revenues are only about a tenth of Zenith Electronics Corp.'s consumer business revenues, but they represent a growing proportion and an area of strategic importance to the company.

Zenith's dp activity is organized under the Computer Systems and Components division of the firm. One group within that division, Zenith Data Systems, has been directing its business microcomputers at selected markets served by 1,000 dealers, 80 distributors, and the company's own sales force. The micros run under such popular operating systems as CP/M and MS/DOS. The Computer Systems and Components division also is a leading oem vendor of video monitors for personal computers, terminals, printers, peripherals, software, and smaller components.

DATAMATION estimates that microcomputer systems accounted for $249 million of Zenith's $1.72 billion in 1984 revenues. Despite a painful shakeout in the pc market, the company expects to maintain its pace of shipments this year. Last year it sold 105,000 personal computers.

Its newest line is the Z-150 family, which includes the Z-150, a 16-bit desktop personal computer, and the Z-160, a portable version. Operating under Z-DOS (Zenith's version of MS/DOS), the models can run nearly all of the applications written for IBM's ubiquitous PC line. Operating in IBM's field means being sensitive to the giant's marketing moves. Thus, Zenith has been forced recently to slash prices on its pcs, cutting the hard disk Z-150 models by $600 and the floppy disk models by $100. Further price cuts are likely, the company hints.

Instead of spending huge advertising dollars in the retail computer market, the company has concentrated on oems and on markets in the military and education fields. For instance, its Z-100 line is sold on private labels by five companies, including Control Data (before it departed the retail trade) and United Press International, which incorporates a Zenith microcomputer in a turnkey system that it sells to small radio stations. Some 900 of the company's dealers add value to Zenith micros before selling them. With its computers installed in 275 universities and colleges in the U.S., Zenith is also the third largest supplier to the education market behind IBM and Apple, according to independent market analysts.

76

CONTINENTAL TELECOM INC.

245 Perimeter Center Parkway
Atlanta, GA 30346
(404) 391-8000

"You acquire companies to telescope time," says Charles Wohlstetter, founder and chairman of Continental Telecom Co. Formed 24 years ago, the company grew into the nation's third-largest independent telephone system largely through the acquisition of some 40 small telephone companies. It is following the same strategy in the high-technology, nonregulated business arena, having spent $350 million in the past six years on acquisitions.

In 1984, the company picked up—for $35 million—Northern Data Systems Inc., a provider of turnkey systems whose software will be used with hardware made by Contel CADO Systems, which Contel bought two years ago.

This spring it was dickering to acquire CADO's distributor network consisting of independent operations with representation in some 200 cities, and also was considering closer ties with Qantel, a Mohawk Data Sciences subsidiary that sells the CADO line of microcomputers, adding its own vertical applications software. It wound up buying MDS's service and credit divisions for $152.5 million.

Last year, as Contel's properties became more diversified, it split itself into four operating groups: telephone operations, business products, networks, and diversified operations. The last three operations provided the data processing revenues of $242.4 million.

That figure is somewhat modest, compared with what the company seems to be expecting in 1985 as it continues to selectively acquire companies that enhance its existing properties. For example, Contel CADO last year reported a 2% drop in sales over 1983, owing to the computer shakeout. Two other operations, STSC, a timesharing operation that lost $1.4 million, and Executone, a manufacturer of business telephones for small business that had a two-thirds decline in income, were expected to perform better in 1985.

In a surprising move early this year, Contel president and ceo James V. Napier resigned to become head of HBO & Co., an Atlanta hospital computer systems supply company. His successor is John N. Lemasters, the former head of American Satellite Co., a provider of telecom networks that is jointly owned by Contel and Fairchild Industries. Unlike Napier, whose background was in finance, Lemasters has an engineering degree from Georgia Institute of Technology and spent 25 years with Harris Corp. before joining American Satellite.

77

CRAY RESEARCH INC.

208 Second Ave. S.
Minneapolis, MN 55402
(612) 333-5889

Cray Research continued its pattern of strong growth in 1984. Revenues were up 34.8% to $228.8 million and earnings grew 74% to $45.4 million, including a tax gain of $6 million courtesy of the tax reform act of 1984.

The firm, which claims 60% of today's supercomputer business, installed 23 new systems during 1984: two were installed internally for software development and marketing support, 13 were commercial accounts, and eight went to research establishments and universities.

Of the 21 newly installed systems, 16 were Cray X-MPs. The company sold five Cray 1/Ms, but clearly the X-MP is the company's premier product. These machines sell for an average price of $10 million. The company has a total of 88 systems in operation worldwide.

Success seems likely to continue. John A. Rollwagen, chairman of the company, said early this year that, "Demand for Cray sys-

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tems remains extremely strong." In January, for example, Rollwagen noted that "Over half of our anticipated 1985 installations are already under contract."

Last spring, Cray announced the first order of a Cray-2 by the National Aeronautics and Space Administation (NASA). According to the company, the new supercomputer is a four-processor, 256 million word system with cpu performance approximately six to 12 times that of a Cray-1. The machine will run the Unix System V operating system.

Cray boosted research expenditures 47% to $37.5 million. The market for supercomputers is apt to change this year, with several new companies developing smaller, less expensive machines that offer near-supercomputer power. So far, Cray has endorsed the new products, licensing its instruction set, operating system, and FORTRAN compiler technology to at least one company to date. Cray's strategy is apparently to support the "baby Crays" and cash in on the upgrade business that it hopes will follow.

78

GENERAL INSTRUMENT CORP.

1775 Broadway
New York, NY 10019
(212) 708-7800

Frank G. Hickey's forecast of General Instrument's fiscal year 1984 was no outside shot. Chairman and chief executive of GI, Hickey hit it right on the nose when he said that "fiscal 1984 was going to be difficult, a year of transition." Net corporate income dropped 37% to $32.7 million in 1984 from 1983's $51.9 million, while corporate revenues of $1 billion were up 14% from 1983. Dp revenues managed to edge up an estimated 7% to $225 million.

Good news is that Sytek Inc. (51% of it owned by GI) continues to increase its revenues in system design and equipment sales for local area network applications.

GI's chip business is still suffering. In 1983, as reported in DATAMATION, "video games turned into horror shows and small home computers stopped going home with consumers." GI still has not recovered from these shifts, and 1984 delays in new manufacturing processes only salted already smarting wounds. The industrywide slowdown in the cable television industry produced more static than profits in the Broadband Communications Group.

Also, GI's loss of major contracts in the state lottery business—Ohio and New Jersey—means $20 million less in gross revenues.

What's needed, say analysts, is new markets. As the Value Line stock evaluating service put it recently, "Small success stories in defense electronics and—potentially—local area networks won't offset the weakness in major businesses."

79

GOULD INC.

10 Gould Center
Rolling Meadows, IL 60008
(312) 640-4000

In April 1984, Gould finally made good on its promise to become an "all electronics" company. The sale of its remaining nonelectronics businesses completed a four-year metamorphosis but, as in 1983, the scars of transition were etched clearly on last year's performance reports. Corporate revenues inched upward 5% to $1.39 billion. DATAMATION estimates that the dp portion of this was $224.5 million, up from $189 million in 1983.

Gould's dp operations are now in its Electronic Systems Group. ESG's two divisions—one responsible for 32-bit superminis, the other for industrial automation systems—both secured deals with China. Eleven universities in the People's Republic purchased $5.8 million of Concept 32/27 superminis for software development and research. And in industrial automation, Gould signed a deal with a Chinese import/export corporation, which called for the manufacture and assembly of programmable controllers in a Tianjin factory.

Highlights from a busy year of product introductions include new line-toppers for its Concept 32 real-time and Unix-based PowerSeries superminis, delivering some 10MIPS each. Gould also entered the burgeoning CAD workstation market with its Power-Station 5100.

Perhaps the real story at Gould in 1984 didn't concern products but people: new faces as well as new products were evidence of the company's transformation. The biggest change was the election of James F. McDonald, a 21-year IBM veteran, to president and ceo. Most recently, the 44-year-old McDonald was general manager of IBM's manufacturing systems operation in Boca Raton, Fla. A bevy of other experienced managers was added during the year, including the former head of Tektronix's Design Automation Group, Peter Strong.

With its transition complete, the corporation now is targeting two of the fastest growing segments of American industry: industrial automation and defense systems. For the first time, the company is positioned to draw on the computer capabilities of its Electronic Systems Group across all areas of its business.

80

APOLLO COMPUTER INC.

330 Billerica Rd.
Chelmsford, MA 01824
(617) 256-6600

Only a few years ago it was common practice for design engineers in the aerospace industry to come to work at 5 a.m. in order to get time on the company's crowded CAD system. In contrast, today's designers conceivably could have access to their own CAD systems, as well as to facilities for developing software and playing around with artificial intelligence concepts—all through a single system called the computer workstation.

Judging by the performance of Apollo, the concept is catching on fast: Apollo's revenues in five years have gone from zero to $215.9 million in 1984, and the company is ready for even more dramatic growth. At year-end it had installed 10,000 workstations and by this spring it had shipped another 2,000 to 3,000.

Apollo workstations derive most of their power and all of their communications capabilities from a proprietary local area network. Domain (for Distributed Operating Multi-Access Interactive Network) consists of a set of dedicated superminicomputer nodes and the communications software.

Until this month, the company had been selling the workstations with its implementation of the Unix System 3 version with a 4.1 extension. It now will be using what it calls Domain/IX, an implementation of the Berkeley 4.2 version of Unix System 5 with some additional Apollo features. The company also sells graphics and database management software, as well as its own version of the Lisp artificial intelligence software.

Still, software is not Apollo's forte, nor should it be. The company sells 65% of its products to oems, who incorporate their own applications software. The remaining 35% is sold directly to scientific and engineering users. Apollo competes largely with Digital Equipment Corp. and other minicomputer makers with strong oem divisions, although IBM is expected to turn its attention to the scientific workstation field within a year to 18 months.

To help control its growth and to prepare for an imminent confrontation with the computer colossus, Apollo last summer brought in Thomas Vanderslice, formerly president and ceo of GTE, to run the company. Apollo cofounder John William Produska Sr. is still the firm's chairman. Since coming on board, Vanderslice has instituted five-quarter forward planning and controls for providing better customer support. Service has, in the past, been a problem area for Apollo: the firm has even admitted to delivering computer systems without manuals and sometimes without line cords.

81

DYSAN CORP.

5100 Patrick Henry Dr.
Santa Clara, CA 95050
(408) 988-3472

The crowded disk-memory business is thinning out. Stiffening competition, changing technology, and recent wild market gyrations, especially in personal computers, have made failures and mergers commonplace.

So it wasn't too shocking last October when two Silicon Valley disk companies announced plans to merge, even though the survivor, Xidex Corp., of Sunnyvale, Calif., with 1984 revenues of $178.2 million, was smaller than its competitor, Dysan Corp., of neighboring Santa Clara, with $214 million in 1984 revenues. (DATAMATION's ranking is based upon Dysan's 1984 performance.)

When the merger was completed last February it created a $390 million company, one that will now hold 18% of the market for flexible media, very close to number one Verbatim, now a unit of Eastman Kodak.

Xidex and Dysan each manufactured 8-, 5¼-, and 3½-inch media. Dysan also made rigid disks, disk packs, and cartridges as well as media for high-capacity Winchester disk drives. Dysan held a 30% share of the rigid-disk market, an activity that will account for a quarter of the merged firm's revenues.

Both firms also had software duplicating services, but with centers in the U.S., Canada, France, and Australia, Xidex claimed it was the world's largest. Xidex also claimed to be the second largest manufacturer of microfiche readers in the world and to hold a sizable share of the market for computer-output microfilm.

The merger has given the new company a leadership position in a fast-changing, volatile market. It enables the two merged firms to combine volume production economies with the strong sales organization that had been built by Dysan. The new company will have a combined total of more than 2,000 retail dealers and distributors and a direct U.S. sales force in 23 U.S. offices.

Xidex will be operated by a three-man office of the president, headed by Lester L. Colbert Jr., who was president of Xidex. Dysan's president, William L. Harry, won't be part of the president's office. He will run the rigid-disk division as a vice president.

82

CAP GEMINI SOGETI

17 Avenue George V
Paris 75008, France
(33-1) 571-1010

The French services companies are by far the most active in Europe, and the Continent's biggest mover on that scene is Paris-based Cap Gemini Sogeti, which had another strong year in 1984. Revenues rose to $206 million (FF1.8 billion), up 27% in local currency. The company's 16% boost in income to $10.9 million is also in marked contrast to the overall poor showing of the French dp services industry.

Cap Gemini's activities outside France now account for 56% of group revenues; Europe contributes 29%, while the remaining 7% comes from the U.S. subsidiary Cap Gemini DASD. Last year's growth was particularly strong in Western Europe. In the States, revenues didn't grow as much as they did the year before, although they were still substantial.

Last year the company's efforts in the field of videotex services started to pay off, both in France and in a number of other European countries. Already responsible for developing France's electronic telephone directory service, Cap Gemini made a bid for the corporate market with its Multitel videotex software.

The company, which also touted its videotex expertise abroad, won a major contract from the Norwegian PTT to design and install a public videotex system in conjunction with Tandem Computers. Other smaller contracts in the corporate videotex sector were signed in Sweden and Germany. Videotex now accounts for 10% of the company's domestic business and roughly 5% of total worldwide revenues.

Cap Gemini also had considerable success with its Multipro software development system, winning a major $6 million deal with one of France's biggest banks, Banque Nationale de Paris. The company is marketing Multipro in the U.S., but so far only on a trial basis.

The company's strength in the European software and services market has recently been recognized in six projects that are part of the European Commission's Esprit R&D program. The projects are primarily in the fields of software engineering, artificial intelligence, and expert systems.

Chairman Jacques Stern's strategy of new product launches, technical cooperation with other vendors, and improvements in customer support seems to be paying off.

83

INFORMATICS GENERAL CORP.

21031 Ventura Blvd.
Woodland Hills, CA 91364
(818) 887-9040

For the past five years, Informatics General has been getting rid of unprofitable operations in an attempt to boost the software company's margins to the industry average of 12%. It accelerated that activity in 1984, selling off its Data Services remote computing operation and three other software services in the apparel industry, life insurance business, and MRP software. It acquired software for the construction and legal fields.

Then it reorganized the company into two business units. (It once consisted of 22, and last year had eight.) The two new units were Informatics Systems and Informatics Applications. The Systems group, which includes software products and custom programming services, places Informatics General as a one-stop shopping center for corporate progamming. Its Applications group bundles software for accounting, construction, distribution, insurance, and legal markets. These newly aligned units will exchange sales leads and other resources. This operation will account for half of total revenues.

Along the way, the company dismissed president Bruce T. Coleman and replaced him with Walter F. Bauer, cofounder, chairman, and now ceo of the 22-year-old software company.

Although the company reported 1983 revenues of $197 million, these were restated to reflect the discontinued operations. In 1984, the company's revenues were $191.1 million compared with the restated 1983 figure of $152 million. The restated net income showed a decline from $8.5 million in 1983 to $4.7 million in 1984. Informatics expects 1985 to be a better year, owing to a strong performance by its Micro/Answer product line, which enables users of microcomputer software to access databases on mainframes.

The company has been building a dealer base of value-added resellers and by the end of 1985 expects to have 150 in place. Previously, its 50 VARS sold only accounting software; now they'll represent all of the firm's applications software.

Despite low profits in 1984, Informatics sees good times ahead because of the reorganization and the judicious pruning of unprofitable operations. At the end of 1984, in fact, employees were wearing lapel buttons that read: "1 billion by 1990." Nobody was wearing a button that explained how this will be done.

84

NBI INC.

3450 Mitchell Lane
Boulder, CO 80301
(303) 444-5710

When Tom Kavanagh left Storage Technology Corp. 11 years ago to start NBI Inc., the company's name supposedly meant "nothing but initials"—and word processing. As recently as five years ago, Kavanagh, who is still the firm's president, believed that NBI's surest strategy was in word processing—nothing but—and that it had to remain separate from data processing.

That, of course, has changed, as did the office. Systems that integrate all office functions are in big demand. Two years ago NBI's profits plummeted 58% when the company was caught with nothing new to integrate the office automation functions. But the company succeeded in developing and marketing products for the office systems market.

By the end of 1984, NBI's profits were up 314% to $14.5 million, based on revenues of $191.1 million.

NBI brought out a line of office automation systems called OASys. One of the systems in the line allows users of IBM Personal Computers to attach up to 100 PCs to NBI systems in an office network. The company also introduced two pcs of its own—the OASys 4100S and 4100X.

It also brought out the OASys 4000SC word processing system for secretaries and clerks. One feature allows the system to convert files that are used on MS/DOS NBI personal computers into word processing documents or vice versa.

Last fall NBI added OASys Mail, an electronic mail and document distribution system. It has added software to serve the legal profession with a product called Juris-NBI. Last year the company established a technical products group and merged it with Integrated Solutions Inc., San Jose, which makes Unix operating systems products. The new technical products division began shipping its first product, a Unix workstation for engineers, later in the year. The system uses the Berkeley 4.2 enhancements to Unix.

With about 170 salespeople in 42 offices in the U.S. and Canada, and 81 dealers and 54 distributors in 16 nations, NBI still feels it must enlarge its marketing activity. Late last year it acquired Commercial Office Products Co., Aurora, Colo., a large office supplies distributor. Negotiations to acquire Computer Consoles Inc., a Rochester N.Y., supplier of computer and telephone systems for offices, fell through early this year, however.

85

QUOTRON SYSTEMS INC.

5454 Beethoven St.
Los Angeles, CA 90066
(213) 827-4600

As several big potential competitors lurk in the wings, Quotron Systems Inc., Los Angeles, continues to hold a commanding 70% of the fast-growing business of supplying electronic stock quotations and other computer information services to brokers and financial institutions.

Its 1984 revenues of $189.7 million were a healthy 23.4% above the $153.8 million reported a year ago. Its income, however, rose only 12.1% to $26.8 million over 1983, sharply lower than the 41% increase in 1982. Much of the lower earnings increase was due to the company's steps to prepare for competition, particularly the introduction of the Quotron 1000, a Motorola 68000-based central processing unit that will add considerable dp features to those its older Q800 system could offer.

Nevertheless, financial observers wonder if the company is too small to remain independent in a business that it is about to share with many heavyweights. One approaching competitor is Merrill Lynch & Co., the brokerage firm that has been Quotron's largest customer, providing about 25% of its business. Merrill Lynch formed

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a joint venture with International Business Machines to offer a similar product called International MarketNet (IMNET), to be marketed in the third quarter.

Quotron chairman and ceo Milton E. Mohr thinks Quotron can prosper without hooking up with a wealthier suitor. First of all, he says, the company has a product—the model Q1000—that is a couple of years ahead of any rival product. The Q1000, in addition to providing all of the stock and commodity quotes, business news, order processing, and interoffice messages that were offered with the Q800, offers such office automation features as word processing, database management, and electronic mail. By early this spring the company had shipped 73 systems.

Quotron was formed in 1959 to offer stock quotation services, but, with a mere 6% of the market, almost went into bankruptcy in 1970. Mohr took over and guided the firm to its present dominant lead.

86

GERBER SCIENTIFIC INC.

83 Gerber Rd. West
South Windsor, CT 06074
(203) 644-1551

H. Joseph Gerber borrowed $3,000 in 1948 to bring out a product he'd designed two years earlier as a student at Rensselaer Polytechnic Institute—a variable scale used to proportion design elements such as curves.

It became the predecessor to a vector photoplotter, a device used to design printed circuit artwork and in the manufacture of tooling production and of documentation. Improvements to the product and the addition of related systems in the computer aided design and manufacturing (CAD/CAM) field gave his company, Gerber Scientific Inc., a record year in 1984—one in which revenues rose 38.1% to $189.7 million and earnings rose 108.8% to $23.6 million. (Its 1985 fiscal year, which ended April 30, was also likely to set records, according to Gerber, who still runs the company as its president.)

Through in-house research and from selective acquisitions, the company in the last three years has been coming out with new CAD/CAM offerings for use in businesses that have big needs for factory automation. This includes aerospace, furniture, footwear, automotive, electronics, construction, printing, and sign making. It has set up four operating subsidiaries, each focusing on a particular market.

The largest operating subsidiary, Gerber Scientific Instrument Co., or GSI, aims at the electronics and graphic arts industries. Its newest product is a plotter controller with a 100% increase in memory capacity over its predecessor. The company last year paid $6 million for EOCOM Electronic Systems Division of Hoechst Capital Corp., Tustin, Calif. EOCOM makes laser-based imaging products for creating newspaper printing plates, exposing printed circuit-board artwork, and direct imaging of printed circuit boards. It does in raster form what Gerber's original plotting product did in vector form.

GSI also introduced a video digitizing system called the VDS 2500 that allows designs, which probably exist only as engineering drawings, to be incorporated into a CAD database for design changes that can then be transferred to a CAM system.

Another subsidiary, Gerber Garment Technology Inc. (GGT), acquired B.F.N. Systems Inc., Bellevue, Wash., a move that led to the introduction of the Gerbermover, a computer-controlled device for designing shoes that, among other features, allows quick decisions on introductions of new color and styles.

87

NOKIA ELECTRONICS

P.O. Box 780
SF-00101 Helsinki, Finland
(358-0) 05671

In the elegant saunas of Finland's capital, Nokia executives got all steamed up last year about the hottest division in their

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company. Nokia Electronics' dp revenues rose to $181 million (M1.09 billion) in 1984, a hike of 29% in local currency.

The Nokia group is the largest privately owned company in Finland, manufacturing everything from rubber boots to high-tech components. The Electronics Division, which accounts for about 37% of Nokia's $1.5 billion 1984 revenues, is split into four major groups. Nokia Data concentrates mainly on selling Honeywell Bull computers in Finland. Nokia Information Systems manufactures terminals and microcomputers. Nokia Telecommunications handles public transmission systems, while Nokia Industrial Automatization peddles factory systems and machine tools. Nokia also has a controlling interest in Sweden's Luxor, which makes consumer electronics products and microcomputers.

Finland, which is Nokia's most important dp market, provides 60% of revenues, with the remaining 40% coming from other Scandinavian countries and West Germany. In addition to its local mainframe and mini base, Nokia also has a strong pc and terminal business. The Finnish firm has made a name for itself in point-of-sale (POS) systems. The company's banking terminals are used by many of Finland's large banks.

These low-end products, as well as Nokia's development capability, enticed Northern Telecom into inking a major OEM deal with the Finnish company in 1983. That agreement began to bear fruit last year, when the Canadian company began selling its Vienna office systems, which couple its PBX with Nokia workstations.

Nokia, which clearly understands that a Finnish firm cannot make it alone, has set up cooperative deals with many other dp firms. In addition to its deals with Bull and Northern Telecom, the company also has pacts with three U.S. firms—Convergent Technologies, robotics company Unimation, and Symbolics Inc. Under the Symbolics agreement, Nokia will distribute the 3600 Lisp workstation in Scandinavia under the new name of MindWare. So this year, with an R&D budget of about $40 million and a series of international tie-ups, a new Scandinavian contender seems to be entering the high-tech hothouse. Nokia will have to increase its export volume way above the current 40% level, however, if it really wants to bloom in the dp field.

88

INTEL CORP.

3065 Bowers Ave.
Santa Clara, CA 95051
(408) 987-5090

Intel Corp. stormed into 1984 like a police tactical squad raiding a bookmaking parlor. The firm's revenues and net income increased 45% and 71% respectively. Revenues were $1.63 billion as opposed to $1.11 billion for 1983. Net income for 1984 to-

totaled $198.2 million, up from $116.1 million the preceding year. While these numbers appeared pleasing at first glance, there was a down side to the chip maker's fortunes. Supply had at last exceeded demand.

As they did for many microprocessing mavens, Intel's orders slowed dramatically in the fourth quarter ending Dec. 31. Net income for that period dropped to $23 million from $47 million in the same period in 1983. Revenues totaled $416 million, compared to $332 million for the same period a year earlier, and down from $432 million in the third quarter of 1984.

"The extremely strong market for semiconductor devices that Intel enjoyed through the first half of the year collapsed near year-end, with orders well below shipments and extensive cancellations and rescheduling of backlog," was how chairman and ceo Gordon E. Moore explained Intel's troubles. Moore added that the firm was still game, spending $180.2 million in R&D in 1984, as opposed to $142.3 in 1983. Intel had also done a lot of hiring as the year closed, with 25,400 employees, up from 21,500 workers as 1983 ended.

From a technological standpoint Intel ended the year with a strong networking winner, the 82588 Personal Workstation LAN Controller. The 1Mbps to 2Mbps chip is an enhanced version of Intel's 82586 LAN coprocessor, which supports the 10Mbps Ethernet local area network. Intel is clearly banking on the 82588 for leadership in the Starlan networking scheme backed by such power players as AT&T, AMD, DEC, and Xerox. Likewise, Intel is clearly counting on a 2Mbps LAN product from IBM, in which the 82588 will play a key role.

As Intel continued its strong commitment to CMOS technology, it announced a number of related business agreements in 1984. The firm signed a technology exchange agreement with Harris Corp., wherein both will collaborate on a CMOS design for a new analog-to-digital voice processing circuit to enhance partitioning of high- and low-voltage functions for interfacing telephone lines, PBXs, and central office switching systems.

Intel transferred the manufacturing tooling for its 80186 microprocessor to AMD as part of a technology exchange. It also entered into a licensing agreement with Oki Electric Industry Co. Ltd.; the latter will manufacture and market CMOS versions of the 80C86 and 80C88 16-bit chips, CMOS versions of Intel's 8-bit 8085A chip, and the 8-bit 80C48, 49, and 50 series chips.

89
UCCEL CORP.

Uccel Tower, Exchange Park
Dallas, TX 75235
(214) 353-7100

Uccel would like to be known as a "pure software company," says its chairman and ceo, Gregory Liemandt. In 1983 he was lured from the presidency of General Electric Information Systems Co. to rescue the 21-year-old software company founded as a service bureau by Sam Wyly in Dallas.

With Wyly at the helm, the company—then called Wyly Corp.—had a reputation as a highflier for nearly a dozen years, although its moneymaking business was in computer software and services. In recent years that business was done through a subsidiary known as University Computing Company (UCC). The company had dabbled in manufacturing, telecommunications (it formed Datran in the early 1970s), and casualty insurance (it acquired Gulf Insurance to feed huge gobs of money to the Datran operation). All of these operations either were sold off or folded.

Wyly (Uccel) lost $7.8 million in 1982 and just scraped through 1983 with a minuscule profit of $219,000. In 1984, its net of $12 million was helped by a $4 million tax credit from tax-loss carryforwards. Nevertheless, real promise was shown with revenues of $173.4 million, compared with $152.9 million the year before.

Although its UCC operations had fallen behind in updating the financial software it had been providing the nation's leading banks, nobody was all that worried at UCC because it was about the only major supplier with which banks could deal. Aided by money from its majority stockholder, Carael Holding AG in Zurich, the company invested $20 million in a four-year research program, called Leading Edge Applications Project (LEAP), that would cut the cost and time needed to write and maintain software and enhance its reliability. Uccel's best customers, the banks, would be the first to benefit, said chairman Liemandt.

Uccel also reorganized personnel, replacing seven of the 12 top officers. The timesharing services operation was trimmed in order to concentrate on software. The services business is becoming less and less important and won't even account for a quarter of the company's revenues in 1985.

Last May, Liemandt took the final step in disassociating the company from Sam Wyly by changing the firm's name from Wyly Corp. to Uccel (pronouned u-sell).

90
SCICON INTERNATIONAL LTD.

49 Berners St.
London W1P 4AQ, England
(44-1) 580-5599

Scicon, a wholly owned subsidiary of the U.K. oil group British Petroleum (BP), had plenty to celebrate early this year. Britain's largest services company toasted its 25th birthday and its best-ever year in 1984. Chief executive Warren Werblow saw revenues leap by 29% in local currency last year to £130 million ($173.3 million).

Unlike many other European companies, Scicon has revenues that are truly international. The largest part of the company's business is done in France through its local subsidiary, Groupe Français d'Informatique, which reported sales of $40 million.

At home in the U.K., the company saw sales rise to $33 million, which is on a par with the company's other main subsidiary, Scientific Control Systems in West Germany. The company does have a Middle East division called Scicon Arabia, mainly because of its involvement with BP and the oil industry, but most of the remaining business comes from the U.S. Here, Scicon bought Systems Control Inc. in 1981 for $10 million. A sister company was then set up—Systems Control Technology Inc.—so that Scicon could pitch for U.S. defense contracts without falling foul of American technology transfer regulations.

Last year, Scicon added satellite communications specialist Telecom General Corp. to its U.S. portfolio. Telecom General sells data communications on the Satnet system owned by Associated Press.

In Britain, meanwhile, BP has been deemphasizing Scicon's telecom interest. The services firm was responsible for BP's stake in private telecom carrier Mercury, set up to compete with local PTT British Telecom. Last year, however, BP decided it didn't want to stay involved with Mercury and sold its 40% stake in the venture.

Scicon was still looking for U.K. investments last year, and bought a small software house called Message Workshop. The company specializes in process planning computer systems for the engineering and textile industries.

Commercial products are very much on Scicon's mind at the moment. Revenues are largely gained from government, military, and industrial contracts. The company has not exploited the international market for products to any great extent. As a result, a separate subsidiary called Sisco was set up to seek out products from within the company and to develop them for international markets. This year, Scicon hopes to put that strategy to greater effect and continue its expansion in local and international software markets.

91
COMPAGNIE INTERNATIONALE DE SERVICES EN INFORMATIQUE

35 Boulevard Brune
75614 Paris, France
(33-1) 545-8000

Last year the fun and games ended for Compagnie Internationale de Services en Informatique (CISI) when it was forced to face up to the harsh economic realities of the dp services business. Fed up with CISI's continuing losses, its parent, the French Atomic Energy Commission, axed its chairman and called for a complete restructuring of the company.

CISI has actually been running in the red for years. Although its 1984 dp revenues of $171.6 million (FF1.5 billion) were up, the company reported a loss of $11.5 million last year.

In both 1983 and 1984, foreign operations accounted for two thirds of the losses. Half of those losses were attributed to CISI-Warton Econometric Forecasting Associates, which CISI acquired in early 1983.

CISI's foreign activities represented 35% of its total revenues. Parent AEC is by far its biggest single customer, accounting for more than 20% of the company's overall business.

Until 1982, CISI's foreign side had been the most profitable part of the company's operations. The slump in the timesharing trade caused the French firm's fortunes to go into reverse. The foreign subsidiaries are being severely pruned back.

AEC's most daring move was to transfer CISI chairman Patrick Nollett, who had managed the company since 1972. Nollett, who now heads CISI's foreign activities, predicts that the international markets will still generate over 30% of group revenues in 1985.

The new chairman of CISI is Henri Cantegreil, who was formerly in charge of a smaller but profitable French service company. Cantegreil supervised the separation of CISI into five autonomous operating divisions. Another unit has been established to oversee all foreign business, with the exception of CISI-Wharton, which remains a separate entity. The U.S.-based CISI-Wharton is hoping for happier days now that it has sold its loss-ridden timesharing subsidiary, Proprietary Computer Systems. CISI itself is also hoping its stateside subsidiary can get back in the black and push it into profitability.

92

CENTRONICS DATA COMPUTER CORP.

1 Wall St.
Hudson, NH 03051
603-883-0111

Centronics produces a broad line of computer printers for original equipment manufacturers, but for quite a while it has been unable to produce a profit. Last year was no exception: net loss was $4.5 million on revenues of $171.5 million.

During 1984, Centronics management completely reorganized the company, centralizing control. President and chief operating officer John R. Morrison explained the move this way: "The reorganization streamlines the company, delineates clear lines of command, and reduces duplication and effects efficiencies." Shortly after this move, things began looking better.

The first bright spot for Centronics occurred in July, when the company introduced its new line of dot matrix printers. The seven new products range from a $299 near-letter-quality, IBM-PC-compatible printer to a quietized, 800-lines-per-minute band printer. When Printer Systems Corp.—which had been a customer of Centronics' largest competitor—signed a multimillion dollar purchase agreement, market acceptance of these products appeared secure.

This order could mean the end of the red ink in Hudson, New Hampshire. The company responded in early 1985, by announcing an agreement to acquire—for about 170,000 shares of common stock—Trilog, Inc. a manufacturer of line matrix printers. Hopefully, absorbing this acquisition won't take management's eyes off the bottom line for too long, so that Centronics stays on the right track.

93

MICOM SYSTEMS INC.

20151 Nordhoff St.
Chatsworth, CA 91311
(818) 998-8844

When Micom Systems Inc. announced its acquisition of Interlan Inc. of Boxborough, Mass., wedding cake temporarily replaced the ice cream, onions, and oranges Micom

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(Marketplace location listed in Table of Contents)

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usually uses to promote its line of data communications equipment. Though the early 1985 event could hardly be called a shotgun wedding, there was an almost immediate offspring: a LAN integrating a data PABX from Micom and cable-based technology from Interlan.

Micom had lots to celebrate in 1984. The company finished another record-breaking year with revenues up 50% to $171.4 million and profits up 38.8% to $25.4 million. Sales were stronger in the United States than abroad. Domestic sales increased 62% while international sales increased 44%. The company blames an unfavorable currency exchange for the slower performance overseas.

Events contributing to Micom's banner year include a contract with AT&T to supply data concentrators and continuing strong demand for the company's line of protocol converters. Also, management has decided to expand cabling services and products from Instanet Cable (formerly Kertech) from a regional operation to one that is national in scope.

Product introductions included the Instanet/Plus, which combines Micom's Instanet LAN—a twisted-pair, low-speed system based on its Micom 600 data PBX—with Interlan's Net Plus, a high-speed Ethernet-type cable system. The company also enhanced the Micro600 data PABX and introduced new modems.

Micom made progress strengthening the distribution side of its business. Its mail-order business continued to grow and accounts for 18% of net sales. LAN products represented 30% of total sales. The backbone of the business is still remote data communications products, primarily, data concentrators and modems, which contributed 46% to total sales.

94

VERBATIM CORP.

323 Soquel Way
Sunnyvale, CA 94086
(408) 245-4400

Competition in the media market pushed Verbatim over the edge during 1984. In the six-month period ending in December, the floppy disk maker lost $9.2 million. For the whole year, revenues were up to $168.9 million, but these produced a loss of $2 million. Verbatim chairman John R. Anderson, who owned about 19% of the company, decided to cash in his chips. He found a receptive audience at Eastman Kodak Co., which had recently announced its entry into the media arena. Kodak offered about $175 million for Verbatim's outstanding shares, and the two companies were set to merge.

Kodak wasn't buying a thriving operation. Verbatim's main line of business is sales to oems, which totaled 54% of sales during fiscal 1984. Verbatim was hurt during the year when a large customer changed designs and reduced orders. Oems were also hit by the slowdown in micro sales: they ordered less media and paid less for what they did order.

As its market was getting tougher, Verbatim was in the midst of a big expansion of production facilities, as well as increased research and development projects. R&D expenses were running 16% ahead of 1983, and administrative expenses were running rampant at 42% ahead of 1983.

Kodak, which is the world's largest producer of photographic products and has annual sales of over $10 billion, will allow Verbatim to operate as a subsidiary. There's no doubt, however, that some changes will be made to bring the new subsidiary back into the profit column before long.

95

CPT CORP.

8100 Mitchell Rd.
P.O. Box 295
Minneapolis, MN 55440
(612) 937-8000

New product delays and slow shipments of older products contributed to CPT Corp.'s disappointing balance sheet in 1984. Revenues slid down $13.3 million to $168.4 million but profits crashed by 68.6% to $5.4 million. In 1983 the company's dramatic growth had slowed, and in 1984 growth came to an end.

After several years of successfully marketing OA equipment to small businesses and offices, the Minneapolis-based company is having to compete more and more with IBM and Wang. CPT lost a battle with Wang to sell $16 million worth of office automation equipment to the Tennessee Valley Authority. The competition has put pressure on pricing. Three years ago a CPT word processor retailed for $18,000. Today that same piece of equipment sells for $8,500.

CPT introduced several new products in 1984, but was late shipping them. Introductions included the CPT Phoenix, a workstation that integrates word, data, and graphic processing. The Phoenix was plagued by delays in software development. A multi-user system called the SRS45 was also introduced along with Office Dialog, a software option for the Office Dialog System that provides full-text search and retrieve capabilities to workstations connected to the system. Other software products introduced include the Interactive Display Emulator and the 3270 SNA connection, and Teletex, an international communications protocol. The vendor still supports the 8500 line of multifunction workstations but revenue growth didn't increase at the same level unit sales did.

Today, 85% of CPT's sales come from North America, with the bulk coming from the U.S., and 5% come from Europe. Lately, though, those sales have been a little harder to come by. It seems that as CPT moves away from its traditional niche in small businesses and IBM and Wang target the little guys, CPT will face more aggressive competition.

96

NORSK DATA AS

Olaf Helsetsvei 5
P.O. Box 25
Oslo 6, Norway
(47-2) 295-400

At home in Norway, national minicomputer maker Norsk Data has the nickname "The Millionaire Factory." Strong growth and healthy profits over the last few years have helped Norsk create more local millionaires than any other Norwegian company—many of them employees of the firm since its early days in the late '60s.

Everything came up roses for Norsk Data again in 1984. Revenues shot up to around $166.7 million (Kr1.36 billion), a 54% increase in local currency. Norsk's earnings per share also grew by 35% to around $2, pleasing shareholders around the world. The company's stock is traded in Norway, Sweden, Britain, and in the over-the-counter market in the U.S.

The bulk of Norsk's revenues come from its minicomputer range, which includes the Satellite, a small 16-bit machine, a larger version called the Compact, and the ND-500 family of 32-bit superminis. All models are controlled by the same Sintran III operating system.

Around 50% of Norsk Data's revenues are generated in Norway, a small market with only 4 million inhabitants. Another 20% of its revenues comes from the rest of Scandinavia, 15% from the U.K. and Western Germany combined, and about 7% from the U.S.

Last year company president Rolf Skar made a determined effort to expand business through acquisition and collaboration. In France a collaborative agreement was signed with the giant French electronics company, Matra. The dp division, Matra Datasysteme, will produce and sell Norsk Data minis under its own label.

In Germany Norsk had already bought the lackluster German computer manufacturer, Dietz Computer. Early last year the Dietz products were replaced by Norsk Data's. The German company's Technovision CAD/CAM system is now being converted to run on Norsk's ND-500 computers.

Norsk Data also got together last year with Britain's Racal Electronics to develop artificial intelligence software for the ND-500 supermini. The joint venture's first task is to develop systems for the offshore oil industry—an industry in which both Norway and the U.K. are heavily involved.

With fast-climbing revenues, Norsk Data is hoping to overcome its only real weakness—the lack of internationally marketable software products.

97

TELEVIDEO SYSTEMS INC.

550 E. Brokaw Road
San Jose, CA 95112
(408) 971-0255

The winds of change that buffeted Silicon Valley in 1984 dumped a bit of unpleasantness upon premier terminal maker Televideo. Revenues were down by 3.4% to $163 million, from $168.7 million posted in 1983. Earnings were off a whopping 80%—$4.5 million, as opposed to $22.4 million in 1983.

The firm's diminished showing had much to do with its entry into the microcomputer market, an arena dominated by IBM. In an attempt to tie part of its fortunes to the mainframe monolith, Televideo introduced the Personal Mini in late 1984. This device allows IBM PCs and PC compatibles to be networked together in a distributed processing mode. Driven by Intel 80186 and Zilog Z80A chips, the machine supports up to eight PCs or 16 PC workstations, has a proprietary InfoShare operating system, and comes with a 40MB Winchester drive and 256KB of RAM. By year's end, Televideo had announced one large con-

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tract: the People's Republic of China had ordered more than $10 million worth under a three-year agreement.

Unlike some in the valley who failed to augur the signs of trouble, Televideo underwent a fast and early retrenchment by closing several facilities and consolidating others as it perceived the truism that a shoemaker is best advised to stick to his own last.

While it soft-pedaled the micro market, Televideo bided its time with a variety of traditional offerings that included the TP 750, its first daisywheel printer. The company is also banking on pushing a line of ergonomically packaged ASCII terminals. Televideo also introduced the 922 terminal, which is compatible with the DEC VT 220 and VT 52 devices. The company began its penetration of the DEC marketplace in 1983 when it introduced the 970 terminal.

98

GENERAL DATACOMM INDUSTRIES INC.

Middlebury, CT 06762
(203) 574-1118

Last year proved to be the most successful year in General DataComm's 15-year history and marked its debut in the DATAMATION 100. Revenues increased more than 67% in 1984 for this vendor of data communications and networking products.

The divestiture of the Bell System helped boost corporate revenues to $161.2 million in 1984 from $96.3 million last year. Profits were up $7 million to $12.6 million. GDI inked deals with Bell Atlantic, Ameritech Communications Inc., GTE Communications Corp., NYNEX Business Information Systems Co., Bell South Services Inc., and the Sonecor Systems division of Southern New England Telephone.

The company considers its markets divided into three parts: business systems, domestic telecommunications, and international. Last year, GDI's business systems sales contributed approximately 55% to revenues with an additional 30% from international sales (mostly in Canada), and 15% from sales to the Baby Bells.

Citing "growth in a controlled fashion," the company underwent a major reorganization in 1984. General DataComm Industries Inc. became a holding company with several subsidiaries, most important of which are General DataComm Industries Inc., which performs commercial work (the bulk of its business), and General DataComm Systems Inc., which serves government contracts. Through the systems division, products are supplied to the Department of Defense, NASA, and other government agencies.

Along with the reorganization, GDI moved from Danbury, Conn., to its new headquarters and technology center in Middlebury, Conn. Last year its engineering department grew by 50% and the number of employees rose to 2,030 from 1,470. The company plans to create new production facilities in nearby Naugatuck, Conn.

The company, which does most of its business in the United States and Canada, increased its research and development spending from 7.1% to almost 11%. New product introductions included enhancements to its 212 modem line, including its 2,400bps modem, the 2412; the Netcon-6 network management system; and software enhancements to the Megamux high-speed, high-capacity, wide-band multiplexor.

99

PLANNING RESEARCH CORP.

1500 Planning Research Dr.
McLean, VA 22102
(703) 556-1000

Celebrating its 30th anniversary made 1984 special for Planning Research Corp., but its birthday gift was mixed news: even though revenues continued to climb, hitting $324.3 million for the year, earnings dropped to $7.2 million in 1984 from $11.3 million in 1983. There was no trouble on the dp side of the business: data processing revenues grew to $161.2 million, up from $135 million in 1983.

The bad news came from PRC's Engineering division, which provides professional services in engineering, architecture, and construction management. This subsidiary had been doing a lot of work in the recession-hit Middle East, and by the first quarter of PRC's fiscal year '85—which ended in September of 1984—the damage was already done. Management announced in its quarterly report that "In early October, a management review determined that the division very likely would be unable to collect an unexpectedly large number of accounts receivable, requiring revenue adjustments and reserves for these accounts. Both management and procedural changes have been made in the division to help assure that such problems do not recur."

In the dp arena, things were going much better. PCR's Government Information Systems obtained a $7.1 million, one-year extension to manage and operate NASA's Scientific and Technical Information Facility, which the company has run since 1980. In addition, the government group was awarded a $289 million contract for the U.S. Department of Commerce's Patent and Trademark Office. This contract runs for 18 years, and will pay between $15 million and $30 million during each of its early years.

One of PCR's newest ventures also got a boost during 1984. This is PRC's Realty Systems, which serves the real estate industry with computer based multiple-listing systems, and publishes computer generated listing books for use by real estate agents. This group produced a 70% increase in operating income during fiscal 1984, despite coming out with a new product during the year. LoanExpress provides automated information on available mortgages and rapid processing of loan applications.

100

LOTUS DEVELOPMENT CORP.

161 First St.
Cambridge, MA 02142
(617) 492-7171

A growth rate of 196% vaulted Lotus Development Corp.'s revenues to $157 million and into the DATAMATION 100. Net income was also up an impressive 151% to $36 million. That's not bad for a company's second year of operation. The first year was pretty amazing: sales went from zero to $53 million, with net income of $14.3 million.

Lotus makes the popular software package Lotus 1-2-3, which combines spreadsheet analysis, graphics, and information management for personal computers. Since 1-2-3 was the company's first and only product, it produced all of 1983's revenues.

Lotus was quick to begin work on its next product. In February 1984, Symphony was announced. Television commercials conveyed the message that Symphony was the encore to 1-2-3. The package integrated word processing, communications, filing, spreadsheet, and graphic capabilities. It was a little tougher than Lotus had anticipated, however, for Symphony to win acceptance in the marketplace.

Within a few months of Symphony's introduction, Lotus announced a new marketing plan to allow other software companies a peek into Symphony, hoping to inspire Symphony-based products.

Wall Street analysts were quick to point out that this was the same tactic that IBM had used when developing its PC, and if the strategy worked for Lotus, it could end up making Symphony the industry standard. Founder and president Mitchell Kapor said, "The fundamental idea was to build Symphony with lots of windows and doors to the outside world."

Shortly after the Symphony marketing change, Lotus announced another new product, this one for the Apple. Called Jazz, it is a business software product aimed at turning Apple's Macintosh into a business machine. Jazz is to be an integrated software package that includes word processing, spreadsheets, a database management system, graphics, and communications. The product was considered by analysts to be necessary for both Lotus and Apple. The Macintosh certainly needed more software to combat IBM's PC, which has Lotus 1-2-3, Symphony, and just about everything else. Lotus needs new products in order to avoid the one-product syndrome epidemic in the software world. Results, however, are mixed. While optimism surrounds Jazz, Lotus was unable to meet the target dates for its introduction. ◉

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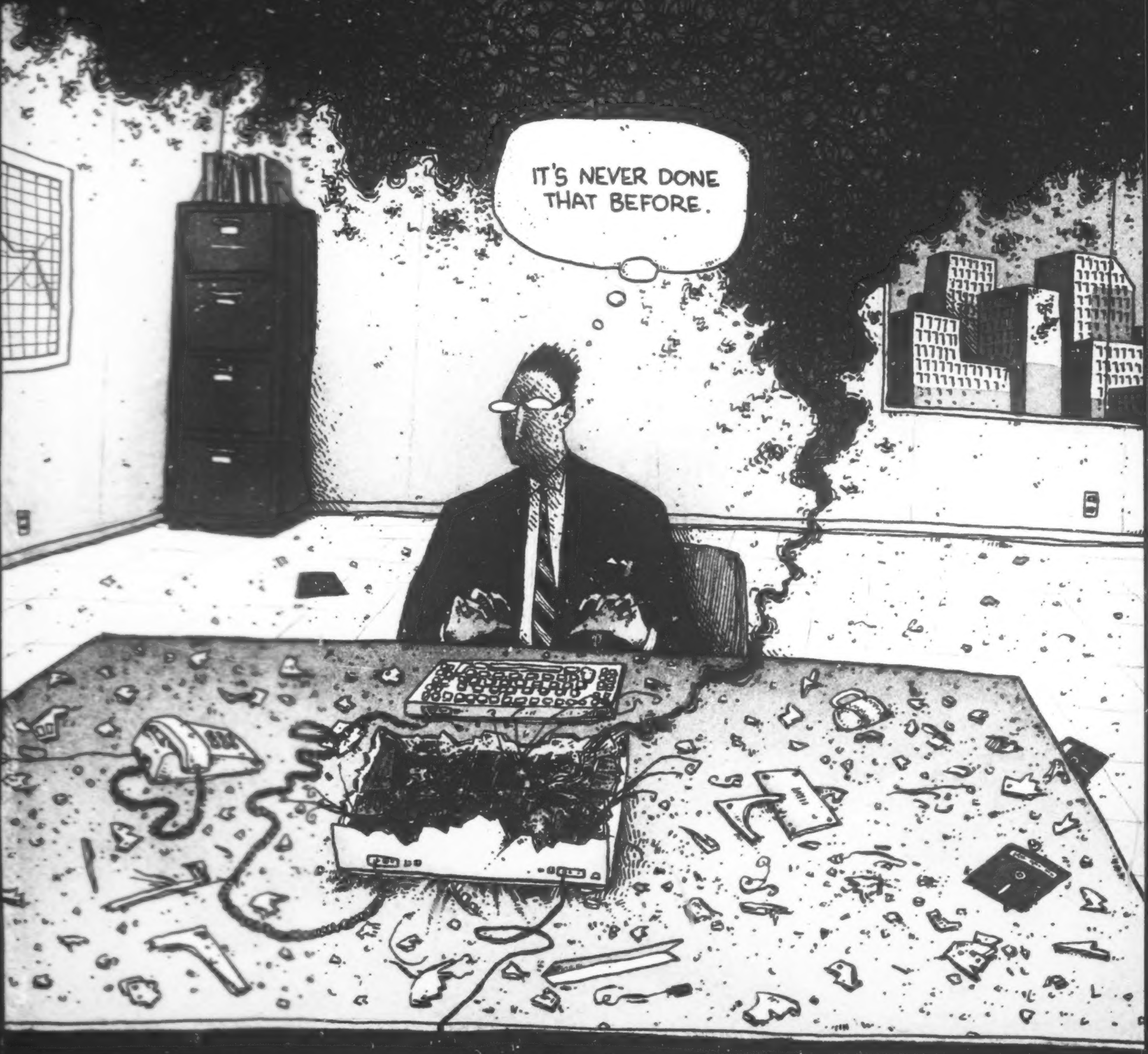
IT'S NEVER DONE THAT BEFORE.

DATAMATION

JUNE 15, 1985/$3.00 U.S.A.
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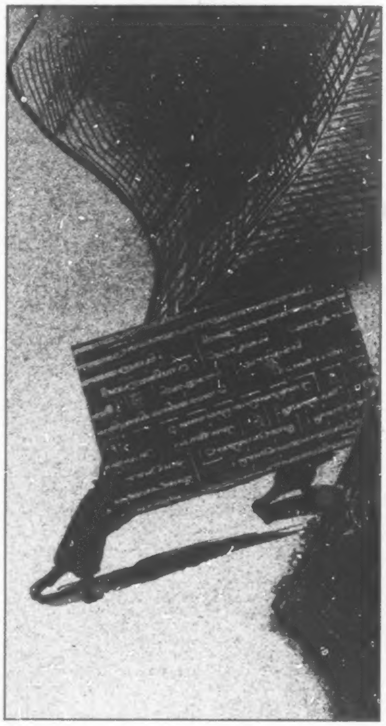
This issue, 194,133 copies

FEATURES

34
IN FOCUS

The well-publicized program of the Western Allies to stem the tide of high tech to the Soviet Union may have backfired, write David Hebditch and Nick Anning. As the "Soviet Sting Sours," both the smuggling and the smugglers are proliferating.



84
BEFRIENDING THE BEFUDDLED
Steve Ditles

Whether power user or virgin, the novice pcer needs help. The dp department can, and often does, supply it.

95
PC SOFTWARE INTEGRATION
Morton Rosenthal and Richard Loftin

If it's right for you, there are two choices: an integrated package or a program integrator. The question is, are you right for integration?

102
CAUGHT IN THE ACT
James D. Smiddy and Linda O. Smiddy

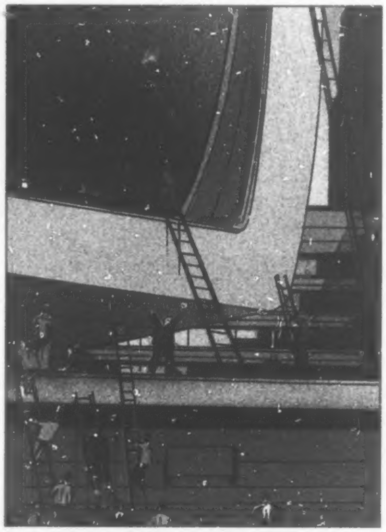
The software development industry, losing over $1 billion a year to software piracy, is trying to get its message across: stopping the copying of pc programs isn't just a good idea, it's the law.

110
SHOWTIME IN CHICAGO

The home of Al Capone and deep-dish pizza plays host to the frenzied hordes of dp. Herewith, a preview of the highlights of NCC '85.

116
COMPUTER LAW
Joseph Kelly

Dp is a huge business, and that means it isn't just for technicians anymore. Legal eagles are flocking to the aid of vendors, users, and legislators.



131
MANAGING DATA-DRIVEN DEVELOPMENT
Frank Sweet

Improved tools are transforming the dp industry. Application generators let you keep doing it until you get it right, and still come out ahead.

NEWS IN PERSPECTIVE

50 **OFFICE SYSTEMS**
Too many choices.
A MAP for the office.
Bringing it all nome.

62 **PROCUREMENT**
A new threat to PCMs.

69 **SOFTWARE**
The Pick push.

75 **VERTICAL MARKETS**
Retail's new twist.

78 **BENCHMARKS**

80 **WORLD WATCH**

DEPARTMENTS

8 **LOOKING BACK**
13 **LOOK AHEAD**
18 **CALENDAR**
23 **LETTERS**
31 **HARDCOPY**
143 **HARDWARE**
151 **SOFTWARE**
156 **ON THE JOB**
159 **READERS' FORUM**
160 **ADVERTISERS' INDEX**

OEM SUPPLEMENT 80-I

-2 **LET GEORGE DO IT**
-9 **SUPPORT YOUR LOCAL SOFTWARE**
-13 **CRAZY ABOUT CAD/CAM**

COVER ILLUSTRATION BY STEVE ATTOE

IN FOCUS

EXODUS UP CLOSE

Operation Exodus is the U.S. Customs Service's attempt to stop the bad guys now before they stop us later. Exodus is officially defined as "an integrated enforcement program to protect our national security by intercepting illegal high-technology exports including arms to Eastern Bloc countries."

It's unoffically defined as a royal pain by a government relations executive of one of the U.S.'s top 10 computer companies.

"We've run into it a couple of times," he says. "It hasn't pinched us to the point where it's affected business. But it delays things more than usual."

That's the idea. Delaying the export process is one of the milder outcomes of a confrontation with Exodus. The operation can be very painful, resulting in detention or seizure. In those cases, post-op recovery can take a very long time.

What doesn't make it past the border is critical technology that violates the Export Administration Act and the Arms Export Control Act. Critical technologies are like opinions—everybody has his own definition. So far, the opinion of Exodus is the last word on the subject.

"In 1982 we had no control here or in any other countries," says Roger Urbanski, director of the strategic investigation division at Customs. "Then we set the example. We put our own house in order by penalizing U.S. industry first."

This was no minor two-minute fire drill. The ensuing sound and fury signified a great deal. Customs discarded its iron fist for a leather glove. Industry was able to prove its case that it knew better than Customs which of its products should not be entitled to take that long trip to the not-so-exotic East.

"I'm convinced that the U.S. export community is paying attention to the letter of the law," contends Urbanski. He didn't say anything about the spirit of the law, but he surely was thinking that the capitalists out there in entrepreneurland were sorely tempted by the easy money. "There's a lot less going out through inadvertent means. We matured and so did industry. Now a majority of our cases involve industry through a tip, a contact, or just turning in another company."

Should a company get caught in the tangled web Customs weaves, two things can happen. Both of them are bad. The goods can be detained, which means Customs just wants to take a look and see what the story is. If the exporter can establish its right to be doing what it's doing, then it may pass Go. It may not collect $200, because it's going to be late, but that's not Customs' problem.

If there's no license or the goods are headed for a controlled country, then they are liable to seizure and subsequent forfeiture, as in the heavily publicized VAX incident in late 1983 (see Fig. 1). The government can force the vendor and customer to forfeit goods worth up to $100,000 without court review. The alleged offender has the right of appeal, but that ain't cheap.

For a three-and-a-half-year-old, Exodus doesn't seem to be doing badly. Even its former detractors concede the program has come a long way.

A few years ago, the computer industry and the U.S. Customs Service were quite antagonistic. Now, says Urbanski, the former antagonists have become friends. Maybe not fast ones, but not slow ones, either. "We're not adversaries anymore," he says. "That's definitely a change for the better. Besides, they know better than we do what products the Soviets are after."

—W.S.

FIG. 1

OPERATION EXODUS BOX SCORE—SYSTEMS

(from Oct. 1981 through March 31, 1985)

NO. OF SHIPMENTS	DETAINED	SEIZED	VALUE (IN $ MIL.)
FY82	2,581	795	54.8
FY83	3,620	1,444	86.3
FY84	2,391	1,459	85.6
FY85	NA	343	28.1
Total	8,492	4,039	$255.2

FIG. 2

OPERATION EXODUS BOX SCORE—PEOPLE

(from Oct. 1981 through Sept. 30, 1984)

Cases accepted for prosecution	351
Indictments	575
Arrests	534
Convictions	347

SOURCE: U.S. CUSTOMS SERVICE

---

siderable expenditure of intellectual resources and money, often at direct cost to the taxpayer, before the West can reestablish its lead."

The Ludlam case is outstanding both because it shows how easy it is to get into the smuggling racket, and because of its unusual outcome. Ludlam was sentenced to a total of two years in jail. His former partner, Christopher Millington, was given a suspended sentence and fined more than $1,000. A fine of $36,000 was levied on Michael Ludlam Associates Ltd. Neither Michael La Costa in London nor Hans Wirth in Switzerland has been charged with any offense.

The sentences came as a shock to observers, who took the view that the prison sentence in particular was harsh and at variance with penalties meted out in other cases in England and in other countries. Comparisons were made with the Nast case in West Germany, where the charges were more serious and the value of the diverted goods some 17 times greater.

Furthermore, the Nast case included a complete semiconductor litho shop, which has considerably more strategic significance than an individual computer system. Volker Nast had previously been indicted in two diversion cases in the United States, but had sought refuge back in West Germany, where he was safe from extradition.

Ludlam says he has few regrets, however. He describes the Bulgarians as "really smart guys. . . . I'm very happy to have done business with them because they're the most honorable people you could wish to meet on business terms. They shake hands on a deal and they pay you within seven days. And if there's a bit of the shipment missing, they still pay you the full money on the basis that they trust you to send it next time. I've no regrets about doing business with them, none at all."

Regardless of Michael Ludlam's assurances about how they are using his computers, it would appear that the Bulgarians have become the Eastern Bloc's main broker for the advanced VAX computer. A Helsinki businessman with ex-

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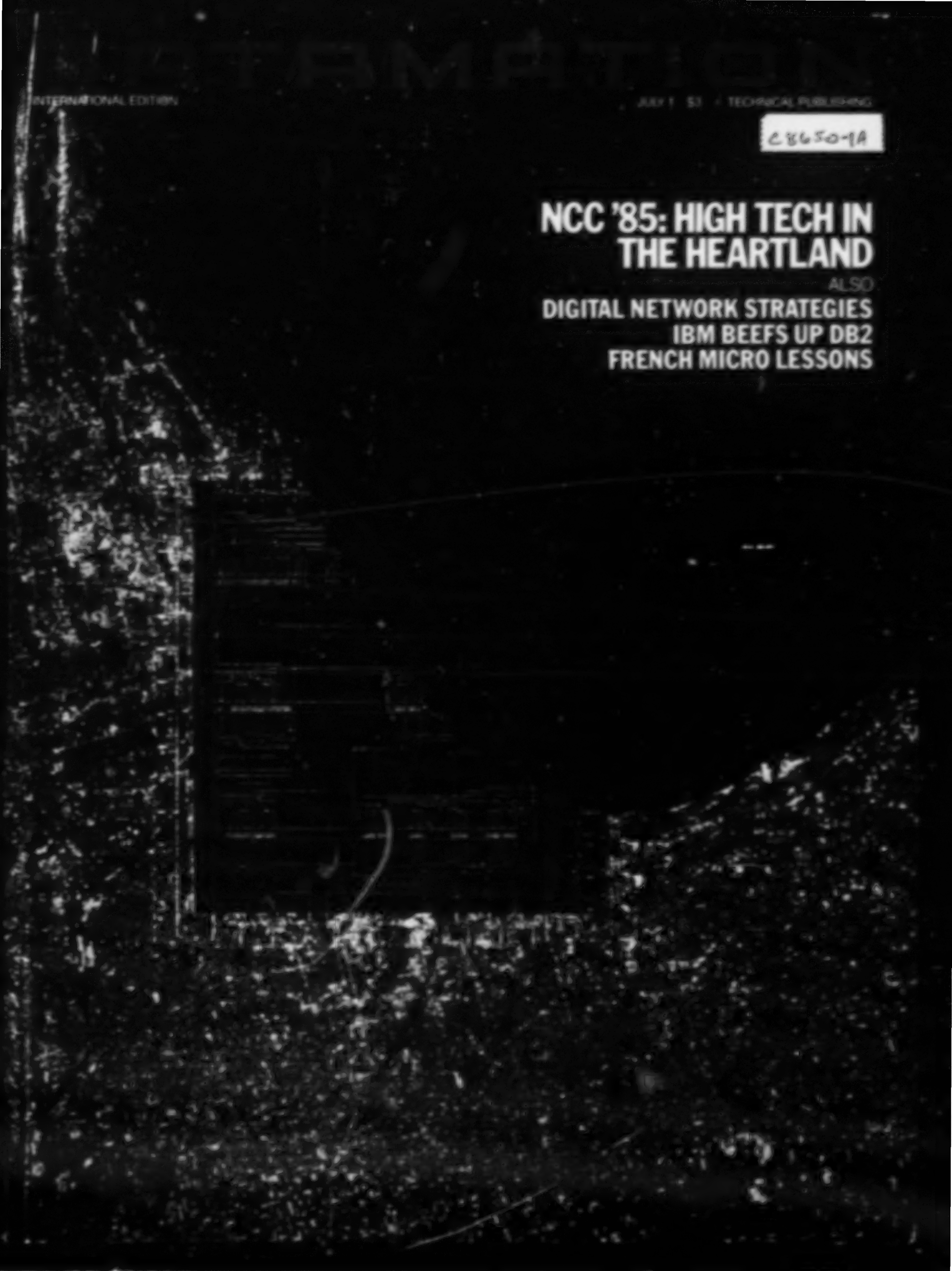

NCC '85: HIGH TECH IN THE HEARTLAND

ALSO

DIGITAL NETWORK STRATEGIES

IBM BEEFS UP DB2

FRENCH MICRO LESSONS

DATAMATION

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VOLUME 31 NUMBER 13
This issue, 197,015 copies

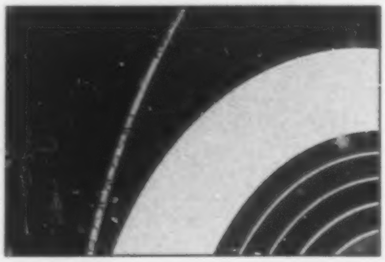
FEATURES

22
IN FOCUS
In a rare interview, Carlo De Benedetti, Olivetti's chairman, talks with Linda Runyan and Paul Tate, displaying the boundless energy that has earned him his reputation as "The Impatient Italian."

81
HIGH TECH IN THE HEARTLAND
Bill Zalud
The climate for high-technology business is better than ever in Illinois and, like other states, it wants more.

102
DIGITAL NETWORK STRATEGIES
Peter G. Balbus and Brian M. NeSmith
Call them problems, call them unanticipated opportunities. Whatever they are, today's telecom managers have plenty of them.

119
FRENCH MICRO LESSONS
James Etheridge
What began as an ambitious plan to catapult a generation of French schoolchildren into the computer age has angered micro suppliers in both the U.S. and Britain.



124
BACKCAST
Frederic G. Withington
An industry analyst and longtime DATAMATION advisor looks back at six forecasts written over the last 15 years for these pages.

138
INDEPENDENCE DAY IN THE PARK
Jackson W. Granholm
How Merle Legrindfussen used a micro to illuminate his superiors and advance his career.

147
COMPUTER ADVERTISING, 1985: THE $2.1 BILLION PRIZE
Efrem Sigel
The growing volume of computer advertising reflects some fundamental trends in the computer industry.

157
THE PSYCHOLOGICAL COSTS OF MASTER COMPUTER
Willem A. Wagenaar
Tired eyes, insomnia, aching back, deep depression. A recent study suggests the user should be blamed more often than the computer.

163
SO WHERE ARE THE PRODUCTS?
Robert J. Crutchfield
They're at NCC, where there may not be as many booths as in the past, but with more than 500 exhibitors, there'll be plenty to see.

NEWS IN PERSPECTIVE

30 **WORKSTATIONS**
Supermini on a chip.
32 **DBMS**
IBM bounces back.
42 **NETWORKS**
SNA to LAN links sought.
Fast, faster, fastest.
60 **SUPERCOMPUTERS**
MFLOPS for the masses.
68 **MANUFACTURING**
Smart cards gain.
76 **BENCHMARKS**

DEPARTMENTS

9 **LOOK AHEAD**
15 **LETTERS**
19 **EDITORIAL**

DATAMATION

169 **HARDWARE**
179 **SOFTWARE**
187 **PEOPLE**
193 **SOURCE DATA**
201 **READERS' FORUM**
215 **SUBJECT INDEX**
224 **ADVERTISERS' INDEX**

INTERNATIONAL 88-1

-2 **UNIX GOES ABROAD**
-9 **PUSHING FOR PORTABILITY**
-13 **JAPAN'S UNIX UNIVERSE**
-14 **MICRO MANIA**

COVER PHOTOGRAPH BY PETER ANGELO SIMON; COMPUTER CHIP BY PHILIP HARRINGTON

produce an industrywide domestic order slowdown at precisely the time when all other environmental forces are favorable for the minicomputer companies.

"It's a most curious juncture in the history of the industry," he adds, "and frankly I see no light at the end of the tunnel until late in the year." Schulman notes that DG's aging 16-bit mini business virtually evaporated in the first quarter, a demise confirmed by DG. "Historically, this product line is the most sensitive barometer of all the major mini makers' revenue streams. Consequently, I believe that the industry has not yet hit bottom."

Faced with such a prognosis, the question facing DEC is whether its MicroVAX II—which, unlike DG's and Prime's offerings, is a market reality now—will attract a host of new users or simply cut into sales of DEC's more profitable minis. Yet the latest DATAMATION/Cowen & Co. survey of 5,000 installations shows that most potential new users are still almost totally preoccupied with digesting and integrating the IBM PC into their mainframe core (see "Up, Up, and Away," May 15, p. 32), meaning that the market for departmental superminis is still relatively small.

More to the point, DEC still doesn't support the IBM PC, and probably won't until late in the year or early next year, according to industry observers. "This is an absolute prerequisite for selling to the Fortune companies," says Dale Kutnick, an independent consultant in Wayland, Mass. "Though DEC's MicroVAX II is two years ahead of IBM, and is the right box for its engineering users and vars, it's the wrong box for corporate America at this time. DEC is moving too fast for the Fortune companies," Kutnick says.

A DEC spokesman counters, "The best hedge against a recession is the right product. There is always a market for the right product, and we believe the MicroVAX II is that product." Sources say DEC hopes to sell 20,000 units by the product's first birthday next July, but, as Schulman points out, a lot of 1985 orders will be at the expense of the low-end VAX 725 and 730 and the medium-sized 750—"all of which carry much higher margins." What's more, Schulman says, the company might not be able to ramp up production of its 8600 and MicroVAX II fast enough over the next few months to replace lost demand for other VAXs. "Evidence of self-impact at the high and low end is already widespread."

Though the MicroVAX may not be the right box for the large corporations—which DEC disputes—it already has many ardent admirers within the var community because of its unparalleled price/performance. Applicon, a var in Burlington, Mass., that buys DEC's computers and then packages them into CAD systems, waxes lyrical about the tiny VAX and says it expects to order 200 of them in the first six months after they become available.

"Should either the U.S. economy or the corporations manage to get back in step with the minicomputer companies through the balance of the year, they should all take off like rockets," Schulman says. If not, the MicroVAX II may soon wind up right back where it was introduced—as an exhibit in a computer museum. ◉

DBMS

IBM BOUNCES BACK

A host of major enhancements to relational database management system packages are coming in September.

by Tom McCusker

Two years ago when it announced a relational database management product called Database 2, IBM not only blessed the relational database concept but also, as it soon became clear, the products of such savvy independent organizations as Applied Data Research, Cullinet Software Inc., and Cincom Systems.

Last year, as DB2 began to seep out among a small, controlled user base, which today numbers about 200, IBM gave the competition more to crow about than just its approbation: it was becoming evident that DB2's shortcomings would give the independents a commanding lead for many reasons. Not the least of these was IBM's commitment to prolonging the life of its aging hierarchical Information Management System approach to database management, while limiting DB2 essentially to end-user applications in the IBM-coined "information center."

So, rather than bring to a screeching halt a rash of competitive DBMS software evaluations, IBM's announcement accelerated these evaluations. A host of user surveys indicate that the independents have placed the majority of DBMS packages in IBM system sites.

A DATAMATION/Cowen & Co. study of 2,947 IBM and IBM-compatible sites (see "Up, Up, and Away," May 15, p. 32) found Applied Data Research and Cullinet to be capturing a hefty 41% of those planning to install a mainframe-type DBMS product over the next two years. Those showing a preference for IBM's products during the same period dropped to 33% from the 40% that had installed IBM products this year.

A study by Computer Intelligence Corp., La Jolla, Calif., and Dataquest, San Jose, two market research firms, found that installations of DBMSs and fourth generation languages by nine independents rose 9% between last October and this April. IBM's increase languished at 2%.

Other market studies conclude that IBM is in trouble—to the extent that a giant bothered by gnats can be considered to be in trouble. International Data Corp. recently predicted that nearly half of the DBMS sales made in 1988 will be made by independents. Studies by the Gartner Group Inc., Stamford, Conn., suggest that IBM's data management products are weak in most functional areas.

Don't count out IBM, however. Consultants and users familiar with the

FIG. 1

DBMS MARKET SHARE CHANGES, 1985 TO 1986

	(IN PERCENT OF 3033/308X SITES		(43XX,370)	
PRODUCT (VENDORS)	1985	1986	1985	1986
IMS (IBM)	30	0	9	4
DL/1 (IBM)	5	2	25	10
SQL (IBM)	5	9	6	12
DB/2 (IBM)	0	22	—	—
IDMS &/R	17	26	20	27
ADABAS (Software AG)	11	4	7	10
Datacom (ADR)	4	17	8	15
Total (Cincom)	5	2	9	6
Other	23	18	16	14

Source: Datamation/Cowen & Co. survey, Jan. 1985 turf say that Big Blue is about to unleash some potent new functionality that will threaten the DMBS upstarts.

Specifically, they think DB2 is a lot stronger than IBM is making public. "Users with whom I talk tell me DB2 performs better and has more features than IBM has presented to them," says consultant Steven Pfrenzinger, president of IMS Consulting Inc., Encino, Calif. He acknowledges, though, that for the most part, IBM customers are remaining with IMS in production environments and are using fourth generation languages instead of DB2 in the information center. "But wait until this fall, when IBM announces new releases to the product." Pfrenzinger warns. He suggests that its features will be strong enough for the company to quickly regain the momentum he says it lost to the independents.

The independents, noting that they have a commanding lead both in the development and availability of relational systems, contend they can remain ahead of anything IBM offers. "As they improve their DBMS, so will we," says Martin Goetz, president of Applied Data Research, who adds that ADR will have a product announcement in September, about the same time as IBM's expected new release of DB2. He said ADR will enhance security features and offer a 20% to 40% improvement in the speed of Datacom DB, ADR's relational DBMS.

Cullinet and Cincom Systems continue to add applications software packages that run with their respective DBMSs. At a time when packages are proving to be considerably more cost-effective than software developed in-house, customers are snapping up both the software package and the DBMS. Cincom's relational system is called the Totally Integrated System and Cullinet's is a version of IDMS called IDMS/R. Cincom, which has installed some 240 TIS systems, including some at sites that are converts from IBM's IMS DC, claims it will generate revenues of $70 million this year from TIS, or about 65% of its total revenues, projected at $110 million to $115 million. Cullinet says it has installed 1,000 copies of IDMS/R and expects to double that number by year-end. ADR has about 900 installations of Datacom DB.

ADR will offer a 20% to 40% improvement in the speed of Datacom DB.

It seems to be just a matter of prospecting. "IBM will get lots of sales without us ever knowing," says Dennis Yablonski, president of Cincom Systems. "But we have a very good track record in beating IBM when we know there's an evaluation under way."

Ronald G. Ross, editor and publisher of the *Database Newsletter*, Boston, cites Cullinet Software's "uncanny market sense for people with bucks to spend." Others may have better products, Ross adds, but none have the intimacy with the buyer that Cullinet has. Informal conversations with dp managers who have opted for Cullinet's products repeat that theme—while another vendor may have a slightly better product than Cullinet's, no one else comes close to offering a more highly integrated package of products.

As long as IBM with its DB2 product follows what is being called a dual strategy, it will remain vulnerable to independents' offerings, market researchers say and competing vendors hope. This dual strategy stems from IBM's need to protect its many thousands of IMS users. It recommends that its relational products coexist with, not replace, IMS. When it announced DB2 in June 1983, IBM said the product "may coexist with and complement IMS," and added that it "will provide an excellent foundation for decision

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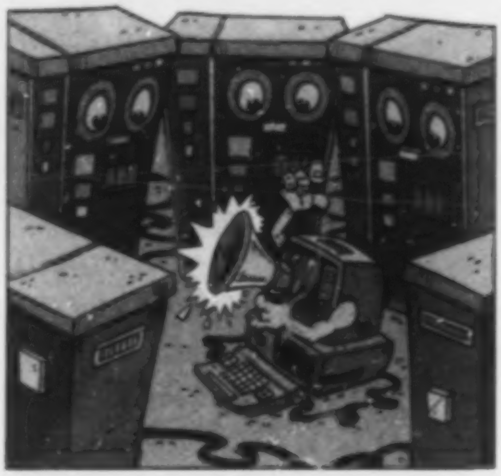

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support systems in information centers.'"

What IBM was saying, explains Goetz of ADR, is that it was "recommending a relational database system for information centers and PC users and a hierarchical/network database product for production users . . . and, in addition, that the data be stored in two databases and transferred between databases as often as necessary to keep the data 'up-to-date.'"

He charges that this is based on a fallacy that end users don't need current operational data and instead can access and update "almost-current data." The fallacy will be wiped away, he adds, as simple PC applications grow in complexity and function, as they are wont to do, and thus evolve into major applications. "If these applications use old data they can thoroughly poison the best conclusions of an organization's decision makers." Goetz, however, thinks IBM's dual strategy will go on for another five years. Paul Hessinger, director of advanced technology research for Computer Task Group, a Buffalo consulting organization, says IBM simply can't overlook the technical complexities in many IMS applications. He believes it is a "borderline impossibility" that IBM will soon change its dual database approach.

ADR and Cullinet have strong migration packages for IMS users who want a relational DBMS.

It's not that IBM couldn't provide a way for users to migrate easily from IMS or DL/1 (products, incidentally, that are believed by market researchers to have generated more than half a billion dollars of IBM's $3.2 billion in software revenues last year) to a relational product. At present it doesn't think that's the way to go, according to several observers.

Ross of *Database Newsletter* recalls how IBM in the late 1970s announced that it wouldn't introduce a relational product until it had a good migration path. That hasn't happened, he noted, adding that IBM introduced a relational DBMS simply because the IBM-generated concept of the information center created a need for one.

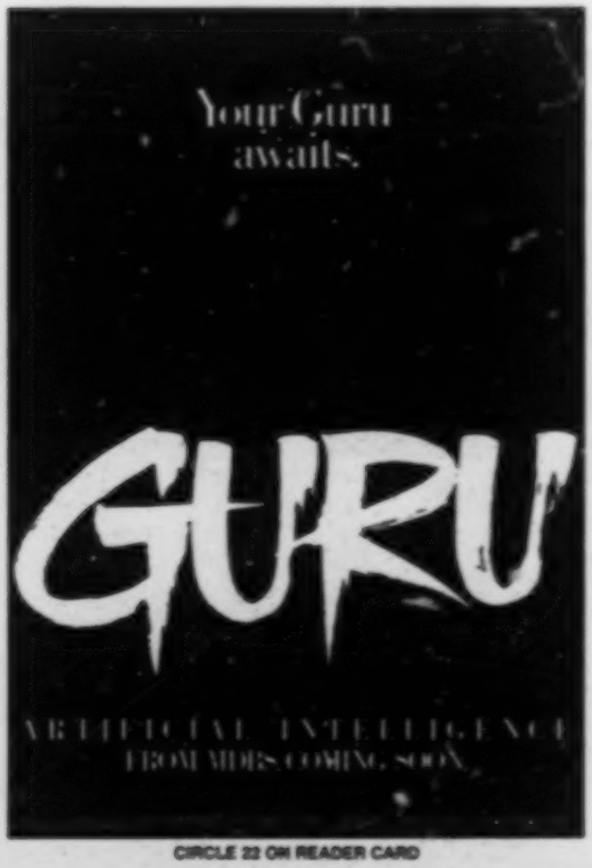
Into the migration path void marched the independents. ADR recently announced DL/1 Transparency, an upgrade package that offers an automated migration path from DL/1 and IMS to Datacom DB. The $40,000 ($30,000 for DOS environments) upgrade consists of utility programs that automatically redesign the database for Datacom DB, load and convert the actual data, populate the database dictionary, and provide an ongoing basis—a layer of software that allows older DL/1 and IMS applications to make calls to the new relationally structured data.

The product, which is being tested at a dozen user sites, will be available in August. Cullinet's product, Escape DL/2, has been in use two years, but the company says it isn't a fully automated tool.

Some sources expect IBM's new release to include microcode assists. Others say DB2 isn't ready to be microcoded yet.

Some 70 IDMS/R sites are using the product. Cincom doesn't provide automatic tools to convert IMS users to TIS, even though 40% of its 240 TIS customers are either new users or users migrating from the IMS family, albeit with fewer applications and thus less complicated conversion problems. "These users simply rewrite their systems," explains Cincom's Yablonski.

TOTAL users converting from Cincom's hierarchical DBMS to TIS don't change programs or files. Instead, they use utilities that enable programs to run in a compatibility mode without the need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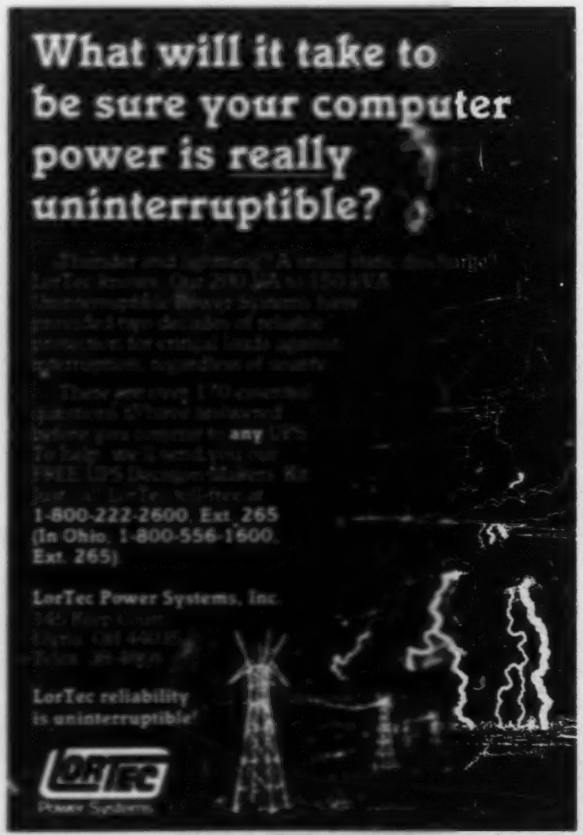
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for an intermediary kind of software, according to Yablonski.

IBM has told investors of its long-term goal of 35% annual growth rate in software revenue. So it must protect its DBMS market, which represents nearly a fifth of its total software revenues. How will that be done?

Pfrenzinger believes that the company will win over customers by offering better performance with its next release of DB2, perhaps even presenting a product that questions the true "relational" nature of competitors' products. For example, he says IBM will announce improvements in the referential integrity of the relational product as well as an improvement over DL/1. He says DB2's performance is only about 50% to 60% that of DL/1. Referential integrity, an essential function in relational database products, applies to logical relationships. It dictates, for example, that a purchase order may not be written for a nonexistent vendor and, conversely, that a vendor cannot be removed from the database if purchase orders are assigned to the vendor. If these relationships aren't defined the system cannot enforce them.

Relational integrity is a feature not fully supported on existing relational systems, contends Pfrenzinger.

Other sources expect IBM's new release to include microcode assists—the placing of a large number of instructions into a much smaller number of instructions that are in microcode. This enhances execution speeds. Others have doubts. "IBM's DB2 isn't ready to be microcoded yet," says Ross, noting that microcoding also means freezing part of a design.

"If these applications use old data they can thoroughly poison the best conclusions of an organization's decision makers."

In all of this speculation, one fact remains clear: IBM has lost and continues to lose ground to independents. Its new release could help it regain that lost territory, even if it doesn't give IBM a product superior to that of its competitors. All IBM has to do, say the observers who follow software trends, is give an indication that it intends to remain in the relational market for keeps and that its customers can feel comfortable that it has their interests in mind. Another fact is clear: large users are looking at competitive offerings. What these users see may not be the appeal of remaining in the IBM fold. Rather, they may be drawn to the products of the independent vendors, who are under great pressure to offer the kind of productivity that end users are demanding today. ◉

NETWORKS

SNA TO LAN LINKS SOUGHT

Software to tie local area networks to an SNA mainframe environment is now available. But are users ready for it?

by Irene Fuerst

Entrepreneurs can be like children. The first kid on the block with a new toy has a certain cachet, a *je ne sais quoi*. Big kids feel the same when they start making toys—they want to sell the first one. But when your toy is made with microprocessors, watch out for the Big Blue schoolyard bully. Not to mention the fact that the other kids may not be ready to play.

All of this comes to mind when one hears California Network Systems, a Milpitas, Calif., startup, claim to be shipping the first gateway to SNA environments from the IBM PC Network. Its gateway simply links a network as a whole to an SNA mainframe, replacing expensive point-to-point links over modems or using IRMA boards, coax, and special software for a mere screen transfer. The CNS package also acts as an ASCII-to-SNA protocol converter.

Called the PC Network/SNA 3270 GateWay, CalNet's product emulates a 3274 cluster controller, allowing pcs on the network to emulate 3270 terminals. CalNet's product line extends from a software package to be used with the PC Network boards to a network server.

CalNet vp Tom Longman acknowledges that IBM has also announced a gateway, but says that his company's product was actually first to ship. An IBM representative says the company's PC Network/SNA 3270 Emulation Program has been available since April for a per user license fee of $375. IBM doesn't seem to be shipping many networks, though, according to outsiders, a fact that could spell trouble for CalNet. IBM declined to provide any PC Network shipment information. IBM has also announced a Series 1 PC Connect that lets the minicomputer act as a gateway between a PC Network and a mainframe running SNA.

"IBM announced a software emulation package, but it's not yet available," says Longman. The IBM product, which requires an IBM PC dedicated as the gateway, costs between $2,000 and $4,000 for 12 users, he claims. CalNet's entry-level

An ambitious project to bring computing to children results in angry micro makers in Europe and the U.S.

FRENCH MICRO LESSONS

by James Etheridge

It began with customary French idealism. In January France's Prime Minister Laurent Fabius announced a $200 million project designed to catapult a generation of French schoolchildren into the computer age. The ambitious plan to install 121,500 microcomputers in French schools was described by Fabius as "an essential element in the modernization of the country."

Two months later that project had angered micro suppliers in both the U.S. and Britain, raised awkward questions about French protectionism, and led to the resignation of the man behind the plan, Jean-Jacques Servan-Schreiber, head of the Paris-based World Computing Center.

That's the trouble with ideals: they often get poisoned by practicalities. Social idealism has been the hallmark of most French governments since the revolution. In recent years that national idealism has been rigorously applied to France's information technology sector. The result has been a plethora of projects that affect local dp firms as well as the general public.

The French government has completely reorganized the local dp industry, merging the old CII-Honeywell Bull, Transac, R2E, and Sems companies into Groupe Bull. The country has also begun doling out money to user companies in an effort to help them introduce new technology. In the public sector, it has started replacing paper telephone directories with a videotex database that can be accessed through free terminals.

The microcomputer scheme for schools, which is called Informatique pour Tous (Computing for All), is only one of many micro programs being undertaken by the French administration. The Computing for All effort, however, is much more ambitious than the others, since it's aiming to have 155,000 machines installed by year-end. At the beginning of the year, 35,000 micros had been shipped to French schools.

The other microcomputer projects involve the French PTT, which plans to install 20,000 micros along with videotex and point-of-sale (POS) terminals in post offices around the country. Police stations will also be equipped with micros at the rate of 500 per year over the next several years. France's justice and finance ministries will also be moving to micros as part of their overall office automation efforts.

What makes the school project so important is the fact that it could well set a precedent for the way micro contracts in France, and even elsewhere, are handed out. That's why the international micro vendors were anxiously awaiting the outcome.

Anticipating massive sales from the mammoth project, French manufacturers jealously fought to preserve their privileged position in a market they consider to be their birthright. Foreign suppliers, particularly Apple and Hewlett-Packard in the States and Sinclair and Applied Computer Techniques (ACT) in the U.K., also fought hard for the business. Reacting with philosophical resignation to the French government's plans, these suppliers recognized that the local producers would inevitably get the lion's share of the business.

That recognition was partly due to actual experience in the French market, which is notoriously difficult for foreign vendors. It was also partly due to remarks made by the man responsible for the school program, Gilbert Trigano, chairman of the successful French holiday firm, Club Méditerranée. Trigano was appointed head of a special interministerial commission that was set up by Prime Minister Fabius to promote new areas of education and training. Despite the fact that there's no government mandate on which wares to buy, there was general support for Trigano's comment that while "there's no question of automatically rewarding French industry, it is inconceivable not to give that industry a real opportunity in the project."

FIG. 1

WHO SOLD WHAT IN THE FRENCH SCHOOL PROJECT

PROFESSIONAL MICROS*	
Bull	6,500
SMT-Goupil	3,000
Léanord	750
Matra	750
Foreign Suppliers	2,700
TOTAL	13,700

HOME MICROS*	
Thomson	93,000
Matra	6,000
CGCT	9,000
TOTAL	108,000

*Estimates

FRENCH SNAP UP CONTRACTS

And that is just what happened. In fact, very few crumbs from the Education Ministry's table fell into the laps of foreign vendors. French suppliers, who snapped up contracts for all the 108,000 home/educational machines, also won orders for 11,500 of the 13,700 professional micros (see Fig. 1). What is more, those contract awards clearly don't reflect the reality of the French micro marketplace, which is dominated by U.S. and U.K. firms.

The big loser in all this was Apple. After company representatives were invited to a rare lunch with President François Mitterrand to discuss the project, the U.S. firm, which was once considered to be the front-runner in the competition, was not even asked to bid. That was a particularly bitter pill for Apple to swallow, since serious consideration had been given to installing up to 300,000 Macintoshes in French schools and public computing workshops. The government's micro machinations also came as a blow to Servan-Schreiber, who originated the Computing for All concept. Servan-Schreiber resigned after the Apple snub and headed for the States (see box).

Once the Apple option was discarded, the bulk of the business went to two local companies. Bull got a big contract for its IBM-compatible Micral 30 machine and Thomson-CSF inked a deal for its small TO-7 and MO-5 home micros. While those French contracts are juicy, they nevertheless pay unspoken homage to IBM, which has succeeded in imposing MS/DOS as the market standard. The choice of the MS/DOS standard came nicely on cue for Bull, which had launched its Micral 30 last December. It was no surprise that the other French manufacturers of IBM-compatibles—Léanord, SMT-Goupil, and Matra—were also given slices of the micro pie.

HP NOT ASKED TO BID

With the exception of Olivetti, which owns local company Logabax, the only foreign firms that were initially invited to bid on the professional micro deal were IBM and Britain's ACT, which has had a subsidiary in France since May 1984 Hewlett-Packard, which has had a micro manufacturing plant in France for years, wasn't even asked to bid—much to its annoyance.

Another company that was annoyed was the U.K.'s Sinclair, which wanted to compete for the home micro contract with its Spectrum machine. The British micro maker was eventually asked to bid, but only at the last minute after chairman Sir Clive Sinclair intervened. In a sharply worded letter to Prime Minister Fabius, Sinclair pressed for the Spectrum to be considered and threatened to call in the European Commission to force France to open the bid to other European companies. Following the French decision to go with national suppliers, British members of the European Parliament did indeed ask for an investigation into France's protectionist policy—a policy that contradicts pan-European trade rules and the strictures imposed by the General Agreement on Tariffs & Trade (GATT).

The French, left with egg on their faces, obviously didn't anticipate the animosity they'd raise by buying local wares. The controversial contracts were awarded with the clear intention of boosting the French microcomputer industry. But that boost may in fact only benefit Thomson, which could now jump ahead of Sinclair to capture first place in the home micro market. And that may have happened anyway, since Thomson's 18% market share in 1984 was already close to Sinclair's 21%, according to Intelligent Electronics Europe in Paris. The micro research house predicts that 80,000 home computers will be shipped in France this year. Government purchases will account for around 13% of those shipments. That means big business for Thomson, which will derive up to 50% of its sales from the government micro buy.

In the professional sector, government orders will represent less than 10% of total shipments. This is of course good news for Bull, which will reap most of its micro revenues from the government award. Bull's Micral 30 has also been selling well outside government circles. Intelligent Electronics expects Bull's share of the professional micro market in France to rise to 10% this year.

The government, however, can do nothing to prevent IBM from taking the number one spot in the French business micro market. IBM, which had 27% of the local micro market last year, is expected to have a hefty 37.5% share this year.

So in the long run, maybe even the short run, those fat local micro contracts awarded by the government will do little to change the micro scene in France. What they will do is get the ball rolling on the Computing for All project, which should be a boon to the French public.

By the end of this year, each of France's 33,000 small secondary schools will get a home micro. The 8,000 high schools and 2,300 colleges in France will each get a cluster of six home microcomputers that will be connected to a professional machine. France's 400 universities will also each receive 10 professional micros. All of this hardware will be supplied with a range of educational software, most of which has been developed in France.

The major obstacle to implementing the computer literacy program this year is training the thousands of instructors needed to teach the children how to use the new microcomputers. Training has also been the big bugbear in Britain, which has been shipping micros to schools since 1980.

In the U.K. this computer wealth has not been shared with the general public. This will not be the case in France, where computer workshops in colleges and universities will be open to the public. Meanwhile in schools, computing will now become part of the regular curriculum. Students will be required to spend at least 1½ hours in front of the screen. The result the government hopes for is a new computer culture among France's younger people.

But while it may be characteristic of the French to consider computing as a culture rather than as a mere tool, abstract idealism doesn't help turn computer literacy into economic strength. It remains to be seen whether this massive investment in cultural evolution produces the expected financial rewards. ●

MIFFED OVER THE MICRO

What French children probably won't know when they sit down for the first time in front of their schools' new microcomputers is that the man who created the government's Computing for All plan resigned because of the machines they are using.

A mixture of visionary, egotist, and political catalyst, Jean-Jacques Servan-Schreiber first announced his dream of a nationwide network of computing workshops last summer. In that dream he envisioned 50,000 computer centers, each equipped with five or six microcomputers. These computer literacy centers, spread throughout France, would initiate the French citizenry in the use of technology, which he believed could liberate people from their most humdrum and arduous activities.

In his vision of things, the liberator he chose was Apple's Macintosh. Apple, which agreed to make the technology available to France on very attractive terms, was going to grant a manufacturing license to a local company. The scheme would have cost up to $600 million.

The French government thought that was biting off more than it could chew. So instead it went for local wares, saving half the cost on a scaled-down project that would also provide a crutch to the ailing French microcomputer industry.

Servan-Schreiber was miffed. First of all, he objected to Apple being tossed out in favor of French machines, which he didn't feel were as appropriate as the Macs. He also was not happy about the fact that the "Servan-Schreiber Plan" ended up as the "Fabius Plan," named after the French prime minister who introduced it.

To demonstrate his disagreement with the government, Servan-Schreiber resigned from his top post at the World Computing Center at the end of March when his job came up for renewal. In his letter of resignation to President François Mitterrand he wrote, "My earlier fears about the government's choices in the delicate and critical field of social computing [hardware and software] have only become more acute, especially regarding the project for a network of community workshops." He went on in a similar disillusioned tone: "Only the right choices in the field of computing, advanced and daring ones if necessary, can liberate the immense human resources of our people."

On that note, he left the project, his job, and the country—temporarily at least. He also left the World Computing Center to carry on without its contentious leader. And while there is no doubt that he felt bitter about the school program, his reasons for quitting may have had more to do with the center than with the micros that French schoolchildren would be using.

Set up to preach the gospel of mass computerization and do research into leading-edge dp, the World Computing Center was beset by divisions and disagreements from its inception (see "Center of Controversy," June 1983, p. 240-31). What's more, French government auditors had the place under close scrutiny. So Servan-Schreiber's exit, whatever the reason behind it, seems to have come at an opportune time.

Computer advertising is on the upswing, reflecting some fundamental trends in the industry.

COMPUTER ADVERTISING, 1985: THE $2.1 BILLION PRIZE

by Efrem Sigel

Veteran readers of the *Wall Street Journal* may have felt they were in a time machine this spring when three silvery bullets kept turning up in issue after issue. But it was not the return of the Lone Ranger in triplets: the legend next to the ammunition read, "We're Gunning for IBM." The ads were the start of Wang's spring offensive—and a most costly one—for its VS system, against the IBM System/36. In a three-week period beginning Feb. 20, Wang ran the equivalent of 12 full pages in the *Journal*, at a total cost of around $900,000. The ad campaign, developed by Boston agency Hill, Holliday, Connors Cosmopulos, could hardly be ignored. "Just give us one shot and we'll blow IBM off your short list," the ads threatened.

Wang's "marketing problem," as described by a company public relations officer, was to get the attention of data processing directors and top management in order to show that "at the departmental level, Wang has a better solution" than IBM.

In such a situation, the purpose of advertising is to achieve awareness among top managers who don't normally hang out with computer salespeople. Joseph Grimaldi, senior vice president at Mullen Advertising, Beverly Farms, Mass., which is handling a heavy schedule of ads for Apollo Computer, Chelmsford, Mass., explains the rationale. "When you're talking about a high-cost item [like a multihundred thousand dollar network of Apollo's design workstations]," he says, "someone in management wants to know about it—and wants to feel comfortable about the supplier." Suppose it comes down to a one-to-one choice between another supplier and Apollo, Grimaldi muses, "The last thing you want is for someone sitting across the desk to say, 'Who?' when your client's name is proposed."

This double target—general management as well as dp specialist—is much in vogue for mini and superminicomputer systems suppliers these days. At Tandem Computers, Cupertino, Calif., which began a print campaign around the theme "computer fat" early in 1985, advertising manager Claudia Hudson explains the reasons for trying to reach top corporate decisionmakers as well as dp/MIS directors.

"Our systems are typically bought by a steering committee," she says. "The chief financial officer often sits on it, along with another member of senior management." It's the data processing experts who bring in a recommendation of what to buy, but it's the financial and general managers who sign off. And at the end of the nine months that it takes the leading maker of fault tolerant computers to close a typical sale, it doesn't want to lose out because the financial vice president has never heard of Tandem.

What is striking about the advertising strategies of Wang, Tandem, and Apollo is that none of these companies lives and dies from sales of high-volume personal computers, where advertising, brand recognition, and retail razzmatazz are regarded as crucial. Wang, Tandem, Apollo, and other firms with growing ad budgets—Digital Equipment Corp., Data General, Prime, Computervision—are selling systems to medium and large customers. The value of a single order can range from $25,000 for a bare-bones mini to hundreds of thousands of dollars for a Tandem NonStop, a VAX, or a Prime supermini. All these companies employ hordes of well-paid salespeople and customer service reps to make the sale and keep the customer happy. So why advertise?

The reasons include all the ones that ad men usually give—to educate and inform the customer, to stimulate demand, to pull customers into the showrooms or onto the trade show floor, to open the doors to salesmen, to make those who've already decided feel comfortable about their choices. And of course there's another, compelling reason: when your competitors are advertising heavily, you often have no choice but to go along.

BASIC INDUSTRY TRENDS

The growing volume of computer advertising reflects a couple of fundamental trends in the computer industry. One is the need to explain products to an ever larger and more diverse audience—a need that has been made especially apparent by the rise of the personal computer. Another is the high degree of competition in many—but not all—segments of the industry. In mainframe computers, where IBM's dominance is overwhelming, neither IBM nor its beleaguered

If your competitors are advertising heavily, you have no choice but to go along.

competitors spend much on advertising. But in superminis, office automation systems, CAD/CAM workstations, personal computers, software and peripherals, where the number of competitors ranges from several to several dozen, advertising is on the upswing.

Communications Trends Inc., of Larchmont, N.Y., maintains a database of advertising spending by more than 100 computer companies in every aspect of the business, from mainframes to minis to pcs to software and services. An analysis of these data shows the following trends.

Worldwide advertising outlays by U.S. computer companies are up 191% since 1981, to $1.87 billion from $640 million. In the same period, the percentage of industry revenues going for advertising has increased from a little under 1% in 1981 to 1.6% in 1984. Fig. 1 shows the growth in computer advertising as projected from 101 companies that represent more than 90% of industry revenues.

Not only has total advertising grown significantly, but its makeup is changing. Computer periodicals, ranging from DATAMATION and *Computerworld* to *Byte* and *Personal Computing,* still carry the heaviest volume of ads ($346 million worth last year, up from $164 million two years earlier). But the fastest growing choices have become television ($264 million in '84, up from only $78 million in 1982) and business magazines and newsweeklies ($258 million in 1984 vs. $110 million in 1982).

The increase in computer industry advertising outlays is closely tied to the rise of the personal computer, the broadening of the base of computer buyers and users from a few hundred customers in the 1950s to hundreds of thousands in the '70s to millions in the '80s. As the computer audience has taken on some of the characteristics of a mass market—at least in gross number—the need for techniques of mass communication, especially advertising, publicity, and promotion, has correspondingly increased.

Fig. 2 shows the relation between personal computer advertising and all computer advertising between 1982 and 1984. Personal computer advertising is up by 332% in this three-year period, and now accounts for more than half of all computer advertising. Nevertheless, advertising for other computer products and services has still grown by an average of 20% compounded annually over the past two years.

FIG. 1

GROWTH IN WORLDWIDE AD SPENDING, U.S. COMPUTER COMPANIES

1981-84 (IN $ MILLIONS)

	1981	**1982**	**1983**	**1984**	**% CHG., 1981-84**
Advertising outlays, 101 companies	575	768	1,256	1,697	195.1
Advertising outlays, entire industry	640	850	1,380	1,865	191.4
Advertising as percent of revenues	.89	1.0	1.43	1.64	

Source: Communications Trends Inc.

FIG. 2

PERSONAL COMPUTER ADVERTISING IN RELATION TO ALL COMPUTER ADVERTISING

1982-84 (IN $ MILLIONS)

	1982	**1983**	**1984**	**% CHG., 1981-84**
Personal computer advertising	220	577	951	332.3
Other computer advertising	630	803	914	45.1
All computer advertising	850	1,390	1,865	119.4
Personal computer advertising as percent of total	25.9	41.8	51.0	

Source: Communications Trends Inc.

FIG. 3

10 LARGEST COMPUTER ADVERTISERS

1984 (IN $ MILLIONS)

COMPANY	**COMPUTER AD BUDGET**	**AS % OF COMPUTER REVENUE**
IBM	518E*	1.2
Apple	180	11.8
Digital Equipment	91	1.6
Tandy	74E	8.1
Hewlett-Packard	65E	2.0
Commodore	62	4.9
NCR	60E	1.5
Control Data	42E	1.1
AT&T	40E	4.0
Wang	39	1.8
Total, 10 firms	1,171	1.8

*E = estimated. Other figures as reported to the Securities & Exchange Commission for calendar or fiscal 1984.

Who spends the most to advertise computer products and services is only partially related to absolute size. Although advertising averages only 1.6% of revenues for the industry as a whole, many personal computer companies allocate 5% to 10% of sales to advertising, with some software companies spending as much as 12%. Yet mainframe companies, certain computer services firms, and the vast array of oem suppliers in the industry usually devote under 1% of revenues, and sometimes as little as one tenth of 1%, to advertising.

IBM is the biggest computer advertis-

The purpose of computer advertising is to create awareness among top managers who don't hang out with computer salesmen.

er, but its proportion of industry spending is far less than might be expected from its size. Communications Trends estimates that Big Blue spent $518 million on worldwide computer advertising in 1984; probably 70% of that total was spent in North America. Yet IBM's ad budget is only 1.2% of revenues. Whereas IBM accounts for 40.5% of the computer revenues of the 101 companies in the CTI database, its advertising outlays represent only 30.5% of combined ad spending by those companies. The next largest computer advertiser, Apple Computer, spends a third what IBM does, although its sales are less than one twenty-fifth as large.

FIG. 4

SELLING, GENERAL & ADMINISTRATIVE COSTS, 101 COMPANIES,

1982-84 (IN $ MILLIONS)

CATEGORY	1982	1983	1984	% CHG., 1982-84
Total computer revs.	76,400	87,850	103,600	+35.5
SG&A costs	19,300	22,100	25,600	+33.0
as % of costs	25.2	25.1	24.8	
Computer advertising	768	1,256	1,697	+121.0
as % of SG&A	4.0	5.7	6.6	

Source: Communications Trends Inc.

FIG. 5

THE SLOWING RATE OF COMPUTER ADVERTISING INCREASES

1982-85

YEAR	TOTAL ADVERTISING	$ INCREASE OVER PREVIOUS YR.	% INCREASE OVER PREVIOUS YR.
1982	850	210	32.8
1983	1,380	530	62.3
1984	1,865	485	35.1
1985P*	2,140	275	14.7

*P = projected
Source: Communications Trends Inc.

ADS PLAY BIG ROLE FOR SOME

Moreover, for Apple and other big spenders, advertising has strategic importance that it will never have for IBM. It is hard to imagine the IBM board of directors agonizing over whether to approve a tv spot, as the Apple board reportedly did before airing the now famous "*1984*" commercial to launch the Macintosh in January '84. Or to imagine an IBM chief executive saying, as John Sculley did in November '84, that a huge advertising budget was one way of preventing Japanese domination of the American personal computer industry.

Fig. 3 lists the 10 largest computer advertisers in 1984 and shows their computer ad spending as a proportion of computer revenues. These 10 firms accounted for $1.2 billion in spending, or an estimated 63% of all industry advertising last year.

Although IBM with its low advertising-to-sales ratio, and Apple, with its high one, are both anomalies, there is no denying that advertising decisions have become more central to the way a computer company presents products and deals with customers. When Tandem got rid of its agency of eight years and awarded its account to tiny Matsumoto-Herzog in Los Angeles, two members of senior management sat on the selection committee; the final decision went to the board of directors for approval.

At Wang, a spokesman said that the company's "gunning for IBM" ads went "right up the line" to president John Cunningham and chairman An Wang for approval. (As a measure of its touchiness on the subject, the company also clamped what it and the agency called a "gag order" on those involved in the advertising program.) Moreover, Wang continued to run the ads at a time when it was reporting highly disappointing financial news, including the revelation that sales growth in the January-March '85 quarter would be only 10%, the entire company would shut down for two weeks in July to get inventories back in line, and top executives would deal themselves a pay cut.

Compared with total marketing and administrative costs for computer companies, advertising is still a minor proportion. But it's growing. What the computer industry spends on selling, general, and administrative costs—SG&A—would be enough to run most countries of the world. The tab in 1984 was $25.6 billion, or 25% of revenues. As Fig. 4 makes clear, this percentage has remained flat for three years—has in fact even edged downward—despite SG&A dollar expense rising 33%. Advertising, however, is taking a notably higher proportion of SG&A today (6.6%) than in 1982 (4%).

Software companies such as Applied Data Research, Cullinet, Computer Associates, and MicroPro have the industry's highest SG&A ratios—for these four the range is between 54% and 70%. The proportion reflects not so much high salaries or lavish spending at headquarters (though that may exist), but the fact that the cost of goods sold is very low for these firms; their products cost very little to manufacture in quantity.

Because advertising is a reflection both of sales anticipations and sales results, trends in spending over time indicate not only where companies have been, but where they think they're heading. Watching the success of Apple, Compaq, Lotus, and Hayes—four successful personal computer companies that are very significant advertisers—many companies figured the way to break into the front ranks was by promoting heavily.

FEW WINS, MANY FAILURES

There are a few successes but many failures: Televideo doubled its advertising in fiscal '84, but sales fell 2%; Kaypro increased advertising fivefold but the company lost money; Data General went on tv to push its laptop portable and other new products, but conceded that sales were falling well short of expectations.

A fickle market for both minis and micros in 1985 is finally slowing the computer advertising stampede to a trot from a gallop: the Communications Trends fore-

A fickle market for both minis and micros is finally slowing the computer advertising stampede to a trot from a gallop.

cast is for a 15% increase in ad budgets this year, down from 35% in 1984 and from 62% in 1983. Fig. 5 shows the deceleration in the rate of growth over the past four years. Even so, more than $250 million in additional advertising dollars will pour into the market in 1985.

John Sculley was always too smart to imagine that selling computers was very much like selling Pepsi. Many other people, however, both in computer marketing departments and in advertising agencies, have not understood that communicating the benefits of a computer is far more complex—and demands a different approach—than hawking soft drinks or breakfast cereal.

The most extreme cases of irresponsibility involve the avid promotion of nonproducts, as for example in Ovation's advertising of an integrated software package that was never shipped. More common, however, is the case of advertising claiming benefits that no product can deliver, certainly not one that takes as much work and investment as a computer system. Three software companies that have tried tv in the past year—Lotus, Ashton-Tate, and Cullinet—have all produced commercials ranging from the incomprehensible to the downright silly, by trivializing what it is they have to offer.

But these companies aren't the only perpetrators. There is an irritating aspect to much of Apple's Macintosh advertising, one which indicates that the Mac's slow penetration of the corporate market has as much to do with Apple's misunderstanding of that market as with business conservatism. For a large company to adopt a new system like Macintosh in volume means a massive re-creation or conversion of files, not to mention plenty of ongoing, routine typing and data entry—mundane, time-consuming tasks that are barely acknowledged in Apple's cutesy "point and click" copy.

In contrast, most of IBM's advertising is commendable for its understatement and sense of proportion. Even the humorous and widely appreciated Little Tramp commercials for the PC are properly hedged; the voiceover tells the listener that with an IBM PC a person can manage his business better, not that the millenium is at hand.

Whatever the slowdown in the rate of growth in 1985, big computer advertising budgets have become a fact of life for the industry; there is no going back to a less promotional era. Because one of the contributions of advertising is increased knowledge and awareness, computer advertising has played a role in creating rising expectations among all computer customers. This process ultimately will work to the advantage not of companies that have the best advertising, but of those who produce products that are worthy of their promotional claims. A tough standard, yes—but who can blame customers for applying a yardstick that computer advertisers have taught them to wield? ◉

Efrem Sigel is president of Communications Trends Inc., Larchmont, N.Y., which publishes a newsletter on computer advertising as well as "Computer Industry Advertising & Marketing Forecast," an annual survey with information on the budgets of 101 individual companies.

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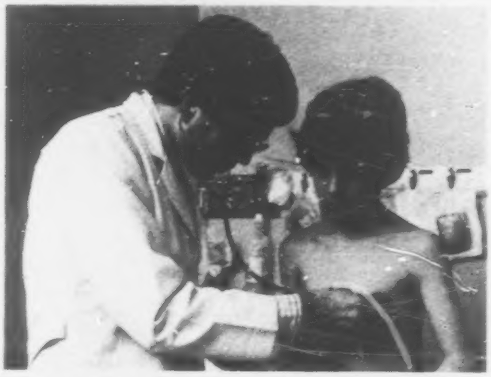

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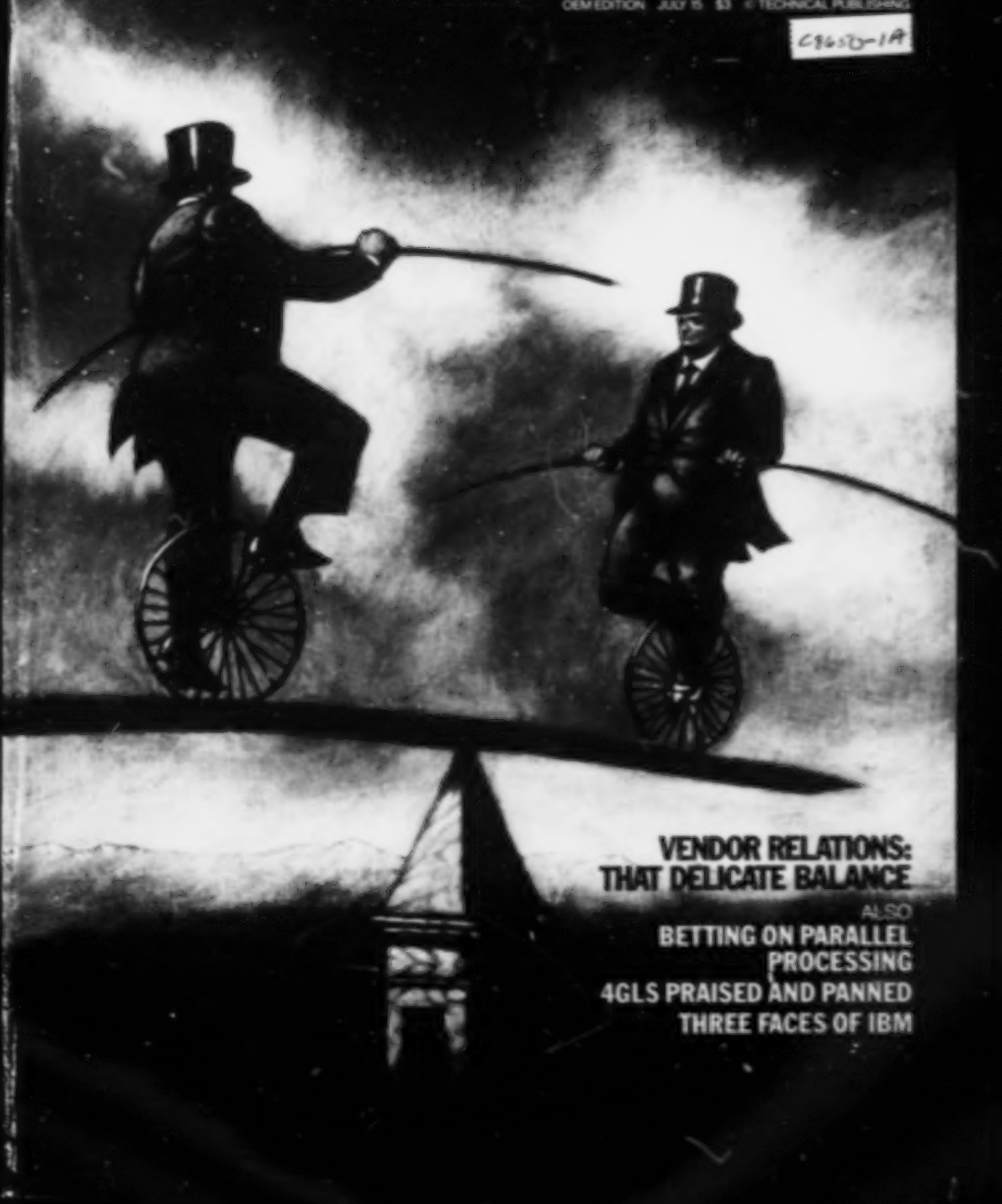

VENDOR RELATIONS: THAT DELICATE BALANCE

ALSO

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THREE FACES OF IBM

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JULY 15, 1985/$3 U.S.A.
VOLUME 31 NUMBER 14
This issue, 184,001 copies

FEATURES

52
NEGOTIATING SOFTWARE CONTRACTS
Charles Edison Harris
Key steps to help you get the most bit for your buck.

62
MANAGING A MULTIVENDOR SHOP
David D. Truax
It may not be easy, but doing it right can result in lower costs and higher levels of reliability.

71
EUROPE'S USERS TALK BACK
John Lamb
Dp customers are more vocal in the old countries.

78
THREE FACES OF IBM
Brian Jeffery
Big Blue's multiple sales personalities are analyzed.

90
IN PRAISE OF 4GLS
Richard H. Cobb
Fourth generation nonprocedural languages are here to stay. Here's why.

99
THE DOWNSIDE OF 4GLS
F.J. Grant
Fourth generation languages are here to stay. Here's why that may be a problem.

125
READERS' FORUM
Frank Sweet pleads for the heads of database administrators in "Guillotine Redundancy," followed by "The Network Comes to Life," a computer-age poem by Thomas A. Goldman. Then, "computer expert" Joseph Larson makes a case for handwriting in "Confessions of a SWAP Programmer."

NEWS IN PERSPECTIVE

30 **PROCESSORS**
Betting the company.
32 **SOFTWARE**
Can RAMIS II deliver?
36 **NETWORKS**
The future is now.
41 **VERTICAL MARKETS**
Weirdware thrives.
44 **TRADE POLICIES**
Yankee bashing time.
46 **BENCHMARKS**
48 **WORLD WATCH**

DEPARTMENTS

8 **LOOKING BACK**
13 **LOOK AHEAD**
18 **CALENDAR**
23 **LETTERS**
27 **HARDCOPY**

109 **HARDWARE**
117 **SOFTWARE**
122 **ON THE JOB**
128 **ADVERTISERS' INDEX**

OEM SUPPLEMENT 48-1

12 **DATAMATION'S TOP VARS**

COVER ILLUSTRATION BY DANIEL ADEL

LETTERS

ATTITUDINIZING

The conclusion of the article "In Search of the Perfect Programmer" (March 15, p. 128) reinforces my theory that the main ingredient of a good programmer is not type but attitude.

The interviewer should spend the time necessary to determine the applicant's productive attitude. It is difficult to hire by type, but quite easy to hire by attitude. The result of hiring by attitude is generally a diverse group of interesting individuals, with at least one thing in common, the need to be productive.

How this group solves its problems is not as important as solving the problems in the scheduled time frame.

ARTHUR McBETH
Conston Inc.
Philadelphia, Pennsylvania

KID STUFF

It was with great pleasure that we read the article by Edith Holmes "DBMS for Kids" (April 15, p. 70). Your readers may be interested to know E. David & Associates had a 3 by 6 VISI-clone for children (called, appropriately enough, Kid Calc) available for TRS-80, Apple, and Commodore 64 computers three years ago.

CARL W. DAVID
E. David & Associates
Storrs, Connecticut

NOT OBSOLETE

While we would like to express our appreciation for your mention of our SideKick software product in "Oil and Water?" (April 15, p. 112), we request that you correct some statements in regard to our product.

First, SideKick was the first RAM resident desktop management package available (there were one or two other nonresident programs available before SideKick was introduced). Second, SideKick was introduced, copy protected, at $54.95. Today, SideKick is also available in a non-copy-protected version, for $84.95.

Third, and most important, SideKick is widely recognized as the best-selling desktop management program on the market today. More than 275,000 copies of the product have been sold since its June 1984 introduction, and Softsel lists SideKick within the top four software products on its weekly "Hotlist."

In addition, we have enhanced SideKick over the past year, and will offer future versions of the product that are likely to enhance the way personal computer users work with desktop management software. SideKick is an evolving product, very much in demand today, and far from obsolete.

ROBIN TYGH
Director of Corporate Communications
Borland International
Scotts Valley, California

Steve Caswell replies:
Sorry for the misunderstanding. I used the word obsolete in comparing SideKick to some other packages that have reached the market with up to 13 more features, not to disparage its position in the market. In fact, the software market operates on name-brand recognition, which makes SideKick the leading package by a large margin. It's the reward for creating a new market category. It's good to hear that you're planning to expand the functionality, though. VisiCalc and WordStar both rested on their laurels and have lost their dominant market positions.

CORRECTIONS

An unfortunate statistical error in the DATAMATION 100 (June 1, p. 36) made it seem that the 1984 revenues of Racal Electronics PLC were down from the company's 1983 revenues: in fact, Racal's revenues were up. Measured in dollars, the revenues were up 14.8%, to $462.7 million from $403 million. In Racal's actual accounting currency, revenues were up 30% to £347 million from £266 million. These figures show that Racal's growth rate from 1983 to 1984 was the sixth highest of non-U.S. companies and that Racal should not have appeared in the "Stunted Growth" chart (p. 39). Racal would move from 51st place to 49th place in the overall rankings

Also, a transposed number in Siemens AG's 1983 revenues inflated this company's growth rate. Measured in dollars, Siemen's 1984 revenues were off 1.1%, to $2.79 billion from 1983's $2.82 billion. In actual accounting currency, Siemen's revenues were up 10.6%, to DM7.95 billion from DM7.19 billion. Siemen's position as number 10 in the DATAMATION 100 ranking is unaffected.

Harris Corp. (p. 101) is still in the terminal business. According to W. Stephen Coleman, Harris's vice president of marketing, "Harris Corp. is committed to the information terminals business and offers leadership products in interactive terminals, remote batch terminals, and distributed data processing systems." Since the beginning of 1985, Harris's Information Terminals Group in Dallas has introduced new products including the Harris 9300 Work Group System and the Harris Challenger Information Display System.

Due to an error in our text processing system, the last paragraph from the Groupe Bull profile was inadvertently inserted into the writeup for Cap Gemini Sogeti (p. 162). Jacques Stern is the chairman of Groupe Bull, not Cap Gemini Sogeti as implied by the misplaced paragraph. The president director general of Cap Gemini Sogeti is Serge Kampf. Also, 27% of Cap Gemini Sogeti's revenues are generated in North America and 73% in Europe. Cap Gemini Sogeti's telephone number in France is (1) 723 61 85.

AT&T was inadvertently omitted from the chart of the leading U.S. dp companies (p. 54). It should have been in 12th place.

N.V. Philips's dp business in 1984 accounted for 6.5% of its total corporate earnings of $16.76 billion. Philips's position in the DATAMATION 100 remains the same.

We apologize for the errors.

In "Wishbook Wonders" (May 1, p. 24) Markline Co.'s 1983 sales figures were transposed: the correct figure is $23 million. Also, according to the company, it does not have a joint venture with Commercial Systems Inc. nor does Commercial Systems Inc. license or participate in the licensing of the Markline Mail Order Software.

A new survey of vars and oems shows that today's hot vertical markets may well cool tomorrow.

HEDGING BETS IN THE OEM MARKET

by Edith Holmes

Larry Fisher, president of Fisher Business Systems Inc., Atlanta, views the current vertical market mania with some amusement. After all, his firm—one of the computer industry's first vertical market software houses—is a veteran in the field after seven years of operation. Drawing on the title and refrain of the popular Barbara Mandrell and George Jones song, Fisher notes, "You might say I was country when country wasn't cool."

Like country and western music, vertical marketing has climbed to the top of the charts after years of obscurity. The phrase is the new tune being hummed by an industry that has begun to mature and thus experience corporate performances that are lackluster at best, given past profits and growth.

But those companies that see vertical marketing as the solution to their present difficulties or the industry's current slump should think twice, according to a just released survey of 2,011 value-added resellers, systems integrators, dealers, and original equipment manufacturers of turnkey computer systems.

Data from the 1985 edition of the *Directory of Systems Houses and Oems* by Technical Publishing Co.'s Sentry Database Publishing unit in Hudson, Mass., show that the success of many market-specific applications swings widely from one year to the next. The numbers indicate that it takes a lot more than selecting a niche of little interest to the computer industry's top performers to make a hit song.

Overall, the vars and oems surveyed—approximately 70% of the total oem/systems house market—did well in 1984, achieving sales to end users of $3.8 billion for a 23% improvement over 1983 revenues of $3.1 billion. And these companies posted this result despite a 9.5% decline in unit shipments of computers, from 171,842 two years ago to 155,574 last year. Whereas the average cost of machines sold through these channels fell between 1982 and 1983, the typical price rose between 1983 and 1984, climbing to $24,430 last year from $18,040.

A closer look at the data, however, reveals that in 1984, dealers, distributors, and commercial oems—23% of those questioned—lost some of their piece of the $3.8 billion pie even though they are more interested in selling vertical systems than ever before. When share is measured in terms of the total value of computers sold, this group saw its portion of the market decline from 20% to 11%. Similarly, software distributors and oems—19% of Sentry's sample—watched their var/oem business drop from 10% to 8%.

On the upswing were hardware/product oems—17% of those surveyed—and systems houses and integrators—41% of those polled—who enjoyed increases in market share from one year to the next of 25% to 31% and 45% to 50%, respectively. The survey data also suggest that systems houses, which sold 7% fewer computers in 1984 than in 1983, charged more for their products, while software distributors and oems, which sold 5% more cpus, lowered the price tags on their offerings.

Further qualifying the reseller market's $3.8 billion performance last year is the fact that fewer new firms entered this field in 1984 than in the previous 13 years. Only 39 firms were formed, the survey shows. Clearly, the average 9% annual growth rate over the last five years is no more. Two thirds of the 2,011 oems and systems houses surveyed opened their doors within the last 10 years. But 1983's expansion rate was only 6%, and the number of vars and oems grew just 2% in 1984.

TYPICAL OEM MATURES

In keeping with the numbers from 1983, the typical oem/systems house is maturing as sales volumes and numbers of employees inch upward. More companies moved into the over $10 million-plus category, a group that now comprises 15% of the firms in the field and accounts for better than 60% of the industry's billings. Thirty-nine percent of the companies surveyed, however, are in the $1.1 million to $10.1 million revenue range, and the remaining 46% have sales of $1 million or less. At the same time, nearly 40% of the firms answering Sentry's ques-

ILLUSTRATION BY DAVID FEBLAND

tionnaire had fewer than 50 employees.

This field still belongs to the small- to medium-sized organizations, and that's not all bad. "There's no [General Motors] in our business yet," says Fisher, a former IBMer, "and that means opportunity."

But the lack of dominant forces in the field means opportunity only if vertical applications are selected with care. Too often, today's boom is tomorrow's bust. A look at the nine broad applications categories used by the surveyors shows that, unquestionably, general business and accounting packages have been king for the last four years and are likely to continue to reign for the forseeable future (see Fig. 1). The number of systems configured for these applications held up even during the 1981-82 recession, grew steadily between 1982 and 1983, and flattened out at a level well above figures for the other vertical categories between 1983 and 1984. Further, seven out of the 10 most popular applications for vars in 1984 came from the general business and accounting group (see Fig. 3). All of the specific applications within this category posted gains in the number of shipments last year.

Special business applications, too, withstood the recession three years ago and have grown another 74% since then. Most individual applications within this group tended to decline in terms of number of shipments between 1983 and 1984, however. The decline affected special business packages, as well as applications in the industrial control, test, and measurement; manufacturing/production control; communications; health/medical services; scientific/engineering; and the catchall "other" categories. Only the typesetting and word processing category showed an increase in the number of systems sold to end users. The numbers suggest that industrial control, test, and measurement and scientific/engineering applications are particularly rough fields in which to market vertical solutions. Industrial control packages, for example, have never reestablished their prerecession system shipment level.

Within these broad categories, the 10 fastest growing and the 10 shrinking end-user markets from 1983 to 1984 show just how fickle these vertical markets can be (see Fig. 2). Last year's survey indicated, for instance, that blood analysis/blood bank accounting applications came close to hitting bottom; data from 1982 to 1983 illustrated a 73.3% decline in system shipments. But this year, these applications lead the chart of the fastest growing end-user markets—up 108.6% in systems sold.

This same wild swing can be seen in several vertical markets. Take medical di-

FIG. 1

TOTAL VAR MARKET BY BROAD APPLICATION CATEGORIES—1984

	NO. OF SYSTEMS/% OF TOTAL			
MARKET	1981	1982	1983	1984
General Business/ Accounting	674,412 28.5	692,757 37.1	1,019,168 28.7	1,146,645 32.3
Special Business Applications	170,378 7.2	246,479 13.2	429,684 12.1	429,548 12.1
Industrial Control, Test, Measurement	246,101 10.4	100,832 5.4	241,475 6.8	184,599 5.2
Manufacturing/ Production Control	487,470 20.6	240,877 12.9	536,217 15.1	518,298 14.6
Communications	132,516 5.6	115,770 6.2	252,129 7.1	220,099 6.2
Typesetting & Word Processing	82,823 3.5	113,903 6.1	196,311 5.5	205,899 5.8
Health/Medical Services	111,21[illegible] 4.7	89,[illegible]29 4.8	227,271 6.4	223,649 6.3
Scientific/Engineering	92,2[illegible]3 3.9	46,681 2.5	95,980 2.7	81,650 2.3
Other Applications	369,152 15.6	220,337 11.8	553,973 15.6	539,598 15.2
Total Systems	2,366,361	1,867,270	[illegible]551,10[illegible]	3,549,984

FIG. 2

FASTEST GROWING END-USER MARKETS FROM 1983 TO 1984

MARKET	% CHANGE
Blood analysis/blood bank accounting	+ 108.6
Membership organization accounting	+ 81.2
Court administration/jury management	+ 67.8
Real estate listing/analysis	+ 38.6
Spectroscopy	+ 25.7
Telephone management/answering systems	+ 25.4
Management information	+ 23.6
CPA client write-ups/billing	+ 23.3
Plotting, drafting, mapping	+ 21.0
Data entry (shared processors)	+ 16.3

SHRINKING END-USER MARKETS FROM 1983 TO 1984

MARKET	% CHANGE
Traffic control	−74.0
Ticketing for sporting/entertainment events	−66.3
Magazine circulation list management	−55.3
Videocassette editing/control	−50.3
Aircraft/aerospace simulators	−49.1
Energy management, power demand control	−36.5
Teleconferencing	−32.9
Process control	−30.6
Automatic test equipment	−30.3
Travel/tour systems	−30.1

agnosis—up 344% in 1983 and down 8.4% in 1984. Or energy management, power demand control—up 76.8% two years ago and down 36.5% last year. Or process control—up 117.5% in the last survey and down 30.6% in this one. Similarly, stock/securities accounting, down 86.7% in systems sold in 1983, posted shipment gains of 15.3% in 1984. Looking on the bright side, none of these vertical applications went as far up or down in shipments last year as they did two years ago.

10,000 IS MAGIC NUMBER

The message is clear: it is essential that vars choose their applications carefully or risk losing a great deal. Because so many of the firms in this business are small, the cost of a mistake may well be the company itself. When selecting a market, "10,000 is the magic number of potential customers," advises Mark Singleton, president and ceo of Complete Office Information Networks, a Norcross, Ga., firm specializing in financial calculation software. After that, the keys are commitment and marketing. "Don't dabble in an industry; live, breathe, and eat that market," says Singleton. Adds Fisher of Fisher Business Systems, "The days of the best or a better mousetrap are over. Beyond an easy-to-use product with good documentation, the var must provide end users with market support in the form of demonstrations, videotapes, and seminars, a justification for buying the vertical system, and an in-depth knowledge of the user's industry."

Still another piece of advice offered by those in the var business is to build a vertical solution around reliable, recognized hardware. And, indeed, sales of minicomputers and personal computers through oems and systems houses reflect that philosophy. The Sentry survey shows Digital Equipment Corp.'s machines in first place in the mini category with 39.4% of the field, and IBM 11 percentage points away in second place with 28.4% of the market among those polled (see Fig. 4). The total number of minis shipped by the survey respondents in 1984 was 40,567, nearly double the 20,424 machines sold a year earlier. Meanwhile, IBM has taken the lead in the personal computer oem market with a 21.4% share (see Fig. 5). Big Blue's nearest competitor is Commodore with 10% of this market, according to the survey. Some 115,007 personal computers were sold through systems houses and oems last year, up substantially from the 67,732 micros shipped by survey participants in 1983.

This year IBM's position in the oem market for minis may well strengthen. The

FIG. 3

TEN MOST POPULAR APPLICATIONS FOR VARS

	1984 UNIT SHIPMENTS	% CHANGE
General accounting (receivable, payable, ledger, payroll)	417,714	+14.8
Word processing	103,140	+10.1
Order entry	99,779	+12.9
Billing/invoicing	96,255	+14.0
Mail list/label processing	95,405	+ 9.2
Database management	93,537	+ 9.2
Sales analysis/forecasting	90,254	+ 5.2
Electronic mail	76 094	+ 8.6
Inventory control	73,097	+ 2.8
Management information	71,246	+ 2.4

FIG. 4

MINICOMPUTER SALES VIA OEMS

	PERCENT SHARE OF MINICOMPUTERS SOLD VIA SYSTEMS HOUSES/OEMS				
MANUFACTURER	1980	1981	1982	1983	1984
Corona Data Systems	—	—	—	—	2.5
Data General	21.6	21.5	11.5	3.1	3.4
Datapoint	2.0	4.2	4.1	3.0	1.3
Digital Equipment	43.5	48.4	42.8	28.4	39.4
Hewlett-Packard	5.2	6.0	7.2	3.9	1.6
IBM	5.4	3.2	4.7	14.5	28.4
Prime	1.5	1.5	11.0	1.4	1.6
Texas Instruments	2.1	1.8	5.5	2.3	3.8
Wang Laboratories	—	—	—	3.9	3.1
All Others	16.9	10.9	11.8	26.9	14.9
Total Sample (units shipped)	14,066	14,463	13,440	20,424	40,567

FIG. 5

PERSONAL COMPUTER SALES VIA OEMS

	PERCENT OF PERSONAL COMPUTERS SOLD VIA SYSTEMS HOUSES/OEMS				
MANUFACTURER	1980	1981	1982	1983	1984
Altos Computer	—	—	4.9	4.6	3.2
Apple	48.7	37.9	20.3	4.9	7.1
Columbia Data Products	—	—	—	1.4	2.1
Commodore	5.9	6.5	5.4	10.3	10.0
Corona Data Systems	—	—	—	3.5	2.2
Cromemco	1.7	2.1	2.4	4.9	2.4
Digital Equipment	—	—	1.0	11.4	6.2
Hewlett-Packard	—	—	—	1.0	1.1
IBM	1.5	3.7	11.3	9.1	21.4
Kaypro	—	—	—	2.2	1.8
Northstar	2.1	4.3	6.1	4.9	2.8
Radio Shack	—	1.9	1.2	1.0	4.3
Televideo	—	—	3.5	8.5	4.9
Texas Instruments	—	—	3.3	4.3	5.7
Wang Laboratories	—	—	—	—	4.0
Xerox	—	1.2	3.4	2.0	6.8
Zenith	—	—	—	—	1.2
All Others	40.1	40.9	36.2	21.1	12.8
Total Sample (units shipped)	18,186	21,750	36,792	67,732	111,007

The fastest growing and shrinking end-user markets show just how fickle these vertical markets can be.

company clearly began to close in on DEC in 1984, increasing its share by 14% compared to Digital's 11%. Texas Instruments trailed far behind these leaders in third place with a 3.8% piece of the market, and Data General was next in line with a 3.4% share—declines for both firms from 1983's survey results. Hewlett-Packard's position continued to weaken last year, as well, dropping to 1.6% from 3.9% in 1983.

In stealing the march on the oem market for micros, IBM boosted its 1983 share of 9.1% by another 12.3%; two years ago, DEC was the leader with an 11.4% share. DEC's piece of the pie shrank in 1984 to 6.2%, as the company backed away from selling its micros to end users through retailers. Several other firms lost share, too, including Altos Computer Systems, a company that has long cultivated the oem world with equipment geared to solving vertical problems. Altos went from 4.6% of this field in 1983 to 3.2% in 1984. TeleVideo suffered a more serious decline, falling from an 8.5% share to 4.9%.

Apple Computer improved its lot in the market for personal computers, however, rebuilding its relations with various distribution channels and increasing its share from 4.9% in 1983 to 7.1% last year. In the meantime, despite efforts to bolster its oem sales, Hewlett-Packard showed a disappointing rise from 1% to 1.1%. Tandy Corp.'s Radio Shack division did better, though; according to the survey, the firm gained a 4.3% market share in 1984, compared with its 1% standing a year earlier. And Wang Laboratories and Zenith appeared for the first time on the systems houses/oems micro sales chart with 4% and 1.2% shares, respectively.

Matching their performance between 1982 and 1983, oem peripheral sales moved ahead another 32% last year (see Fig. 6). All told, 645,228 devices of all types were sold in 1984 by survey participants. Printers top the list of peripheral sales last year at 216,512 units, up 55% over the earlier year, followed by crt terminals and monitors at 203,648, up a whopping 213% compared with 1983. The only declines posted by survey respondents were for 14-inch Winchester drives, down 2%; reel-to-reel drives, down 3%; and digital plotters, down 25%.

FIG. 6

PERIPHERALS SALES VIA OEMS

TYPE OF PERIPHERAL	QUANTITY SOLD VIA OEMS				
	1981	1982	1983	1984	% CHANGE
Printers					
Dot matrix	51,156	68,994	82,999	120,747	+ 45
Letter-quality (daisywheel, thimble)	—	20,524	25,761	45,713	+ 77
Line printers (under 300 lpm)	8,710	6,494	7,860	12,775	+ 63
Line printers (300 lpm & up)	6,833	6,581	8,270	15,691	+ 90
Teleprinter terminals (with keyboard)	27,633	19,403	14,830	21,586	+ 46
Group Total	**94,382**	**121,996**	**139,720**	**216,512**	**+ 55**
Disk Drives					
3½-inch floppy disk drives	Not covered in previous years			34,614	—
5¼-inch floppy disk drives	Not covered in previous years			92,388	—
8-inch Winchester drives	4,558	8,423	6,843	15,584	+ 128
14-inch Winchester drives	—	3,690	4,671	4,594	− 2
Fixed disk drives	682	3,675	4,466	18,349	+ 311
Removable disk drives	11,197	8,958	7,610	19,234	+ 153
Group Total	**57,673**	**83,549**	**94,588**	**184,763**	**+ 40**
Tape Drives					
Cassette/cartridge drives	4,444	6,708	8,106	10,454	+ 29
Reel-to-reel drives	4,323	4,296	6,463	6,256	− 3
Group Total	**8,767**	**11,004**	**14,569**	**16,710**	**+ 15**
Crt Terminals/ Monitors					
Alphanumeric	89,008	96,007	52,147	177,188	+ 240
Graphic	5,578	8,006	12,816	26,460	+ 106
Group Total	**94,586**	**104,013**	**64,963**	**203,648**	**+ 213**
Other					
Memory expansion boards	13,034	14,643	7,558	31,276	+ 314
Digital plotters	773	1,205	3,093	2,319	− 25
Group Total	**13,807**	**15,848**	**10,651**	**33,595**	**+ 215**

LEADER IN DOT MATRIX

Okidata led the dot matrix printer category with 24.9% of the oem market (see Fig. 7). Although this represents a 4.3% decline from the earlier year, Okidata's nearest competitor is still several percentage points away and has other problems to contend with: Epson America posted an 11.1% share of oem dot matrix sales—as well as a first time 10% share of the letter-quality printer sales—but the firm must now contend with the loss in May of IBM as a major customer.

NEC continues to lead in letter-quality printers with a 23.4% share, though this company, too, experienced a slip of 8.2 percentage points between 1983 and 1984. Next in line is Diablo, another firm that faced declining sales and layoffs last year, with a 14.4% showing. In the category of line printers under 300 lines per minute, Dataproducts wrested first place from Oki-

Two new categories were included for the first time: 3½- and 5½-inch floppy disks.

data, expanding its market share from 15.6% to 20.1% while its competitor fell from 17.5% to 10.9%, according to the survey. IBM appeared in this printer category for the first time last year, capturing a 3.3% share. Dataproducts lost share in the field for printers operating at 300 lines per minute and up, dropping from 13.6% to 10.1%. Another big loser in this category was Printronix, which gave up its 26% leadership in this field to a newcomer: Fujitsu showed up for the first time and won top billing with a 12.7% share. Meanwhile, Texas Instruments took the lead from DEC in teleprinter terminals with keyboards, boosting its share from 18.9% to 23%. DEC plunged from 32.6% of this market in 1983 to just 6.7% last year.

The Sentry survey included two new categories for the first time: 3½-inch and 5½-inch floppy disk drives (see Figs. 8 and 9). Survey respondents put Shugart solidly in the lead in the 3½-inch category with 29.6% of the 34,614 drives sold, while IBM edged into first place in the 5½-inch field with 14% of the 92,388 drives shipped. Shugart was number one again for 8-inch Winnies with a 35.7% share (see Fig. 10). Fujitsu followed a distant second with 10%. The Japanese company has a firm grip on the 14-inch Winnie and fixed disk drive markets, though. Its piece of these fields was 13.1% and 28.6%, respectively, the survey said. In removable disk drives, Tandem is king with 52.1% of the market, which was up 153% last year.

Several new companies entered the market for cassette/cartridge tape drives in 1984, appearing in the survey for the first time (see Fig. 11). Among these firms are Alloy Engineering, Data General, Syquest, and Tanberg Data. Also new, Cipher Data Products jumped in and captured an 18% share, thus challenging Kennedy, the category leader with 20.4% of this market. Cipher Data won the lead in the reel-to-reel tape drive category, beginning with a 7.3% share in 1983 and seizing 29.5% of the market last year, despite declining shipments. New to the oem market for reel-to-reel drives, Kennedy is next in line with a 10.9% share.

Both alphanumeric and graphic terminals and monitors posted a strong showing in shipments for 1984, according to the survey, up a total of 213% (see Fig. 12). Evenly divided among several vendors, the market for alphanumeric crts is led by TeleVideo with 12.8%, Zenith Data Systems with 10.6%, and Digital Equipment Corp. with 10%. The graphic terminal category saw three new entrants in 1984—Adage, which captured a 1.6% share of the market; Amdek, which became the leader

FIG. 7

DOT MATRIX PRINTER MARKET SHARE

MANUFACTURER	1983 OEM MARKET SHARE (%)	1984 OEM MARKET SHARE (%)
Anadex	—	7.1
Apple Computer	—	1.3
C. Itoh	—	1.9
Dataproducts	1.5	1.4
Datasouth	3.8	2.2
Digital Equipment	6.0	5.1
Epson America	10.3	11.1
IDS	—	1.9
Juki	—	5.0
Mitronics	—	6.6
Okidata	29.2	24.9
Printronix	1.2	1.6
Star Micronics	6.1	4.5
Texas Instruments	7.5	5.9
All others	34.4	19.5
Total Units	**82,999**	**120,747**

FIG. 8

3½-INCH FLOPPY DISK DRIVE MARKET SHARE

MANUFACTURER	1983 OEM MARKET SHARE (%)	1984 OEM MARKET SHARE (%)
Apple Computer		19.9
Hewlett-Packard		2.1
Micro-Sci	This category not included in previous years.	2.9
Mitsubishi		1.4
North Star Computers		2.9
Shugart		29.6
Tandon Magnetics		4.3
All others		36.9
Total Units		**34,614**

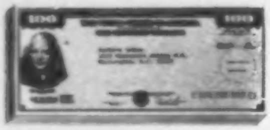
FIG. 9

5½-INCH FLOPPY DISK DRIVE MARKET SHARE

MANUFACTURER	1983 OEM MARKET SHARE (%)	1984 OEM MARKET SHARE (%)
Apple Computer		2.9
Control Data		12.0
Digital Equipment		2.5
IBM	This category not included in previous years.	14.0
Shugart		12.4
Tandem		1.1
Tandon Magnetics		11.0
Teac		1.5
Verbatim		10.8
All others		31.8
Total Units		**92,338**

Bridalveil Fall, Yosemite National Park, California c. 1927. Photography by Ansel Adams. Courtesy of the Ansel Adams Publishing Rights Trust. All rights reserved.

SOME OF THE GREATEST THINGS IN AMERICA NEVER CHANGE. SOME DO.



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OEM EDITION

The vars and oems surveyed—about 70% of the total oem/systems house market—did well in 1984.

FIG. 10

8-INCH WINCHESTER DRIVE MARKET SHARE

MANUFACTURER	1983 OEM MARKET SHARE (%)	1984 OEM MARKET SHARE (%)
Atasi	—	1.9
Control Data	2.4	3.3
Data General	1.7	1.1
Digital Equipment	1.3	1.3
Fujitsu	9.9	10.0
IBM	—	2.4
NEC	2.8	3.4
Qume	—	2.6
Shugart	15.3	35.7
All others	66.6	38.3
Total Units	6,843	15,584

FIG. 11

TAPE DRIVE MARKET SHARE

CASSETTE/CARTRIDGE TAPE DRIVES

MANUFACTURER	1983 OEM MARKET SHARE (%)	1984 OEM MARKET SHARE (%)
Alloy Engineering	—	1.7
Archives	17.4	10.0
Cipher Data Products	—	18.0
Commodore	13.4	6.1
Control Data	1.2	2.1
Data General	—	1.5
Digital Equipment	12.1	1.3
Hewlett-Packard	4.0	1.8
Kennedy	2.6	20.4
Syquest	—	1.4
Tanberg Data	—	1.9
All others	49.3	33.8
Total Units	8,106	10,454

REEL-TO-REEL TAPE DRIVES

MANUFACTURER	1983 OEM MARKET SHARE (%)	1984 OEM MARKET SHARE (%)
Cipher Data Products	7.3	29.5
Data General	4.5	6.8
Digital Equipment	8.5	6.0
Fujitsu	—	2.1
Hewlett-Packard	6.0	4.4
IBM	2.0	2.8
Innovative Data	4.0	4.0
Kennedy	8.5	10.9
Memorex	—	4.8
STC	—	1.3
All others	59.2	27.4
Total Units	6,463	8,256

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OEM EDITION

Some 115,007 pcs were sold through systems houses and oems last year, up substantially from 1983.

FIG. 12

CRT TERMINALS MARKET SHARE

ALPHANUMERIC CRT TERMINALS

MANUFACTURER	1983 OEM MARKET SHARE (%)	1984 OEM MARKET SHARE (%)
Adds	4.9	8.0
Data General	1.6	1.8
Digital Equipment	13.7	10.0
Electrohome Ltd.	3.3	2.8
Hazeltine	3.5	2.7
Hewlett-Packard	—	1.1
IBM	1.2	3.0
Lear Siegler	5.1	3.1
Micro Term	3.4	2.5
Televideo	16.5	12.8
Texas Instruments	2.7	2.8
Visual Technology	2.1	1.5
Wyse	—	4.5
Zenith Data Systems	5.1	10.6
All others	36.9	32.8
Total Units	**152,147**	**177,188**

GRAPHIC CRT TERMINALS

MANUFACTURER	1983 OEM MARKET SHARE (%)	1984 OEM MARKET SHARE (%)
Adage	—	1.6
Adds	4.9	2.4
Amdek	—	22.9
Aydin Controls	4.8	2.9
Digital Equipment	5.0	2.0
IBM	—	2.2
Intecolor	3.9	1.9
Visual Technology	7.5	4.5
All others	73.9	59.6
Total Units	**12,816**	**26,460**

with 22.9% of the field; and IBM, which won a very modest 2.2% piece of the pie.

Otherwise, the Sentry survey shows an explosion in sales of memory expansion boards from 7,558 units shipped in 1983 to 31,276 sold last year, a 314% increase. Again, the market is fairly evenly divided among several vendors, though AST holds the lead with a 10% share. According to the survey, the substantial growth in memory products attracted three new firms to the field last year: Alpha Micro, Persyst, and Quadram.

While sales of memory expansion boards were way up, shipments of digital plotters fell from 3,093 units in 1983 to 2,319 units last year. In the meantime, Hewlett-Packard took the lead in this field from Houston Instrument, upping its 11% 1983 share to 28.1% while Houston Instrument saw its share tumble from 30% two years ago to 14%.

On the whole, the survey data reflect a flattening market for computers and peripherals. The immediate effect is a lower growth rate than the industry has seen in the past and, in some cases, even a decline. In the long run, there will be fewer oems and vars—all the more reason to avoid panaceas like vertical marketing. The numbers show what those in the business for a time already know: there is no quick fix to the current downturn, and vertical markets, while potentially very profitable, demand considerable management skill. ◉

The 1985 *Directory of Systems Houses and Computer Oems* lists 2,011 companies in alphabetical order, by location, and by primary cpu vendor. It is available from Technical Publishing, 5 Kane Industrial Drive, Hudson, MA 01749.

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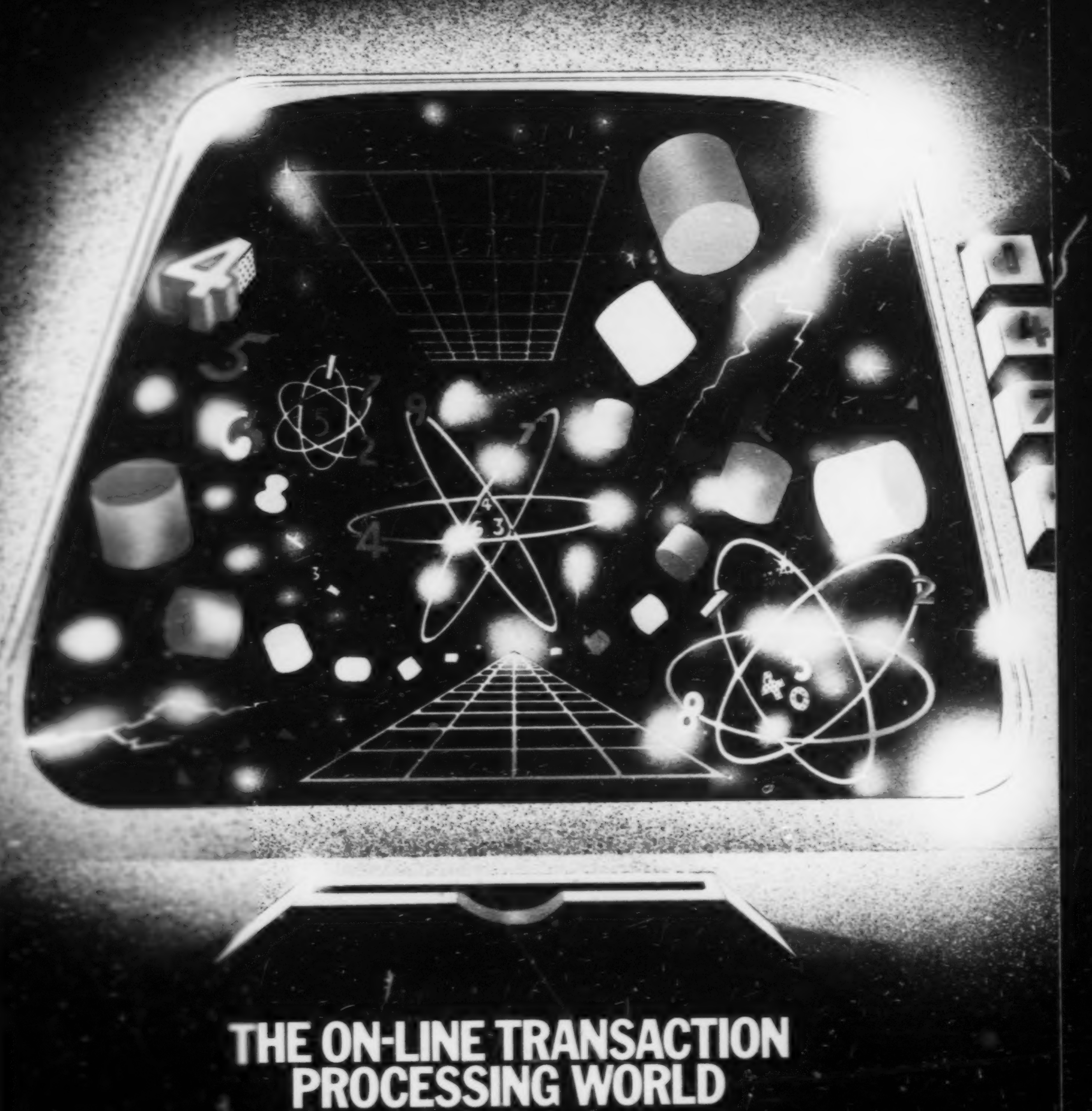


THE ON-LINE TRANSACTION PROCESSING WORLD

TOOLS FOR DEVELOPING OLTP APPLICATIONS

BACK OFFICES ON BACK ROADS

DATAMATION

AUGUST 1, 1985/$3 U.S.A.
VOLUME 31 NUMBER 15
This issue, 192,650 copies

FEATURES

22
IN FOCUS

Many companies are finding the low rents and still open spaces outside the city very attractive. Robert M. Garsson reports that for MIS, too, it makes sense if "Dp Goes Suburban."

60
EXPLORING THE OLTP REALM

Omri Serlin

From airline reservation systems to financial applications—everything you thought you knew about OLTP and more.

73
TOOLS FOR DEVELOPING OLTP APPLICATIONS

Lawrence A. Rowe

Fourth generation languages and other development aids make it easier to develop transaction processing systems in lower-performance environments. Before long, these same tools will be available for high-performance systems.

86
INFORMATION POLITICS

Mark Klein

The modern corporation has a pressing need to aggressively and appropriately apply information technology.

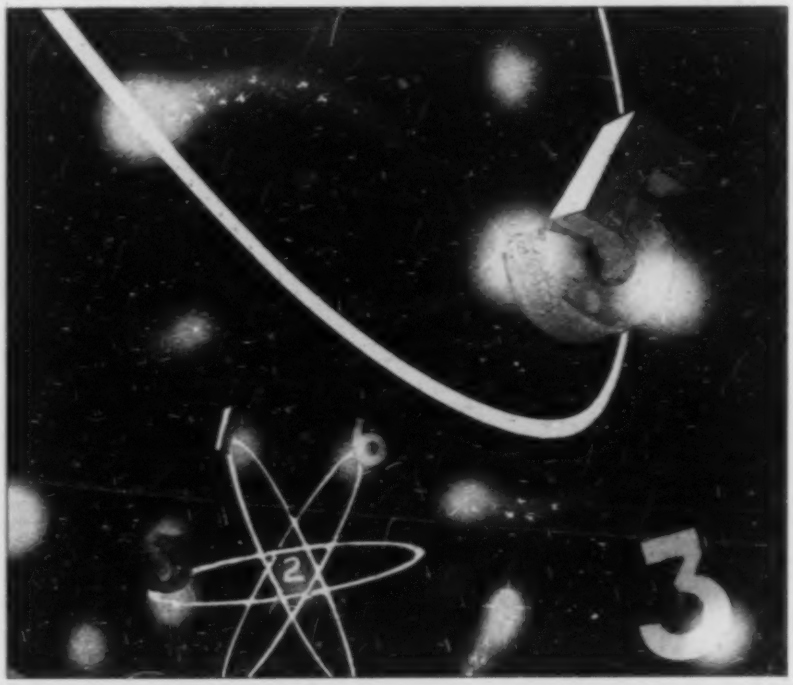
97
POWER AND CREDIBILITY IN OFFICE AUTOMATATION

N. Dean Meyer

Office automation is a politically parlous endeavor. So why coerce people when you can persuade them with results?

127
READERS' FORUM

It is a fact in today's highly mobile corporate world that learning new systems has become a way of life. It is also a fact that most data processing departments don't have the time to provide continuous staff training. So, how are new users trained? Through the highly unstructured but often productive system known as "Oral Tradition," says Mark Hall.



NEWS IN PERSPECTIVE

32 **INTERNATIONAL**
Russia's five-year cpu plot.

34 **SOFTWARE**
Time to drop anchor.

39 **NETWORKING**
Hey dad, where are you?

46 **SUPERCOMPUTERS**
Straight and narrow.

52 **MICROCOMPUTING**
Late to school.

56 **BENCHMARKS**

DEPARTMENTS

9 **LOOK AHEAD**
15 **LETTERS**
19 **EDITORIAL**
105 **PEOPLE**
111 **HARDWARE**
117 **SOFTWARE**
123 **SOURCE DATA**
128 **ADVERTISERS' INDEX**

INTERNATIONAL 56-1

-4 **EUROPE'S 1984 VINTAGE**
-15 **NEW SHADES OF BLUE IN EUROPE**

COVER ILLUSTRATION BY ANDREA BARUFFI

DATAMATION rates the most fruitful firms in a maturing market.

EUROPE'S 1984 VINTAGE

by Paul Tate and Linda Runyan

Savoring the sweet taste of success, Europe's leading data processing companies reaped bountiful revenues last year from a market that's steadily maturing. Growth was good in 1984 for these fruitful firms that harvested combined revenues of $28.3 billion, up a hearty 9.7% in dollars.

IBM, the champagne of companies, leads the list of top 25 firms, despite results that were less than sparkling last year. The dp giant still had an easy climb to the top of the vendor vine, with European revenues that were more than five times higher than its closest rival, West Germany's Siemens. The DATAMATION survey also shows a sharp falloff of $272.7 million in revenues between NCR, which ranks 13th, and Wang, which holds the number 14 position. The dozen dpers that come below Wang are closely clustered together on the table that cuts off at Data General, which pulled in European earnings of $220.1 million. That cutoff point was much higher last year than it was in 1983, when DG was also in the cellar, with a turnover of $163 million.

The 1984 European 25 survey was compiled exclusively by DATAMATION from information culled from an in-house database that tracks the dp results of over 200 companies thoughout the world. This expanded database enables DATAMATION to present a more accurate picture of the best performers in the European market. Some 1983 figures have therefore been restated and appropriate adjustments made in the rankings.

Making the biggest jump on the European 25 table was Hewlett-Packard, which moved up four notches to seventh place. Taking the biggest dive was Britain's ICL, which dropped down four slots to number 10. Overall, there was little change in company positioning, with most firms staying approximately in the same spots they held in the 1983 survey. In fact, six of the 25 winners captured the exact same ranks they achieved in 1983.

The total European dp revenues were, of course, much higher in 1984, reflecting the general upturn in European economic conditions over the year. The expansion of the European economies was slow but steady, with national growth rates hovering at around 2%. That upswing, though modest, had a big impact on the dp industry, which benefited from more widespread spending on computers and communications wares.

Spending was particularly strong in the microcomputer sector, so strong that Commodore, with European sales of $406 million, and Apple, with revenues of $315 million, were able to enter the ranks of the top 25 in 1984. Business was very good for Commodore in France, in West Germany, and even in Olivetti's backyard, Italy, where earnings were up over 1,000%. Sales were more sluggish in the U.K., where Commodore had much stiffer competition.

Big Blue also took advantage of the European micro movement. The PC, which became the best-selling microcomputer on the European scene, helped IBM boost its sagging revenues. The company's puny 5.9% increase resulted in European dp revenues of roughly $11 billion, which represents 39% of the combined revenues of the top 25—a weaker position than in previous years. Nevertheless, the percentage of revenue that IBM Europe contributes to corporate earnings is continuing to shrink. Last year its European business accounted for 25% of worldwide revenues, compared with 42% back in 1979.

IBM's European subsidiaries, however, still recorded good growth gains in

PHOTOGRAPH BY TOGASHI

terms of local currencies. IBM U.K. was up 40%, IBM Italy 20%, and IBM France 19%. IBM Germany, which posted a scant 6% increase, was the notable exception. Big Blue's biggest breadwinner in Europe, IBM Deutschland, saw profits slump to $260,000 in 1984.

DROPOUTS AND DEBUTS Another mighty U.S. multinational, ITT, dropped off the top 25 table this year, despite a hefty 20% hike in European dp sales to $200 million. Also absent from the league of leaders were France's Thomson-CSF and American pcmer Amdahl. Business was a lot better for Europe's leading pcmer and magnetic media mogul BASF, which made its debut in Datamation's European 25 survey. The West German firm derived $134 million of its $298.2 million in total dp sales from peddling Hitachi mainframes and peripherals. Most of those sales came from Germany, the U.K., and France.

Minicomputer makers also did well in Europe last year. In fact, Digital Equipment did so well that it was able to move up one notch in 1984. DEC's arch rival, Data General, staged an impressive comeback in both Europe and the States. The Massachusetts mini manufacturer registered a 34% spurt in European revenues, compared with a dismal 4% in 1983. And while business is looking a little bleaker this year for the company in its homeland, DG is expected to garner healthy sales in Europe, where its CEO office automation wares have scored big points.

DG's sales surge puts it on Datamation's list of fastest growers in Europe (Fig. 1). Also on that table are four companies that didn't make the 1984 European 25—Norway's Norsk Data, Italy's Finsiel, Britain's Scicon, and France's Cap Gemini Sogeti. Norsk Data's 54% boost in European dp revenue to $142 million reflects the mini maker's continuing dynamic growth. The mushrooming micro market in Europe last year also accounts for the phenomenal revenue gains of U.S. micro firms Commodore and Apple, which posted jumps of 92% and 75%, respectively. Both are newcomers to Datamations's European 25.

With the exception of ICL, which posted an increase of only 8.3%, the slowest growers were all American companies. In that stunted growth group were NCR, up 1%; IBM, up 5.9%; Control Data, up 7%; and Honeywell, up 9.5%. The U.S. firms were clearly hurt by the strong dollar. The steep currency slide also took the edge off the earnings of European companies when measured in dollars. The currencies most affected by the bubbling dollar were the

FIG. 1

FASTEST GROWERS IN EUROPE

ERP. 25 RANK	COMPANY	% CHANGE IN AAC	ERP. DP REV. ($ MIL.)
15	Commodore	92.4	406.6
18	Apple	75.0	315.1
37	Norsk Data	53.7	141.7
31	Finsiel	43.2	156.0
36	Scicon	41.4	142.1
14	Wang	37.3	435.7
24	Ferranti	36.5	226.6
7	Hewlett-Packard	36.2	992.0
25	Data General	34.4	220.1
34	Cap Gemini Sogeti	30.4	150.4

FIG. 2

LEADING EUROPEAN DP COMPANIES

	COMPANY	COUNTRY	WORLDWIDE DP REV. ($ MIL.)	% CHANGE IN AAC
1	Siemens	W. Germany	2,789.5	10.6
2	Olivetti	Italy	2,012.4	28.2
3	Bull	France	1,555.6	16.8
4	ICL	U.K.	1,222.7	8.3
5	Nixdorf	W. Germany	1,147.4	20.7
6	L M Ericsson	Sweden	1,123.3	24.7
7	Philips	Netherlands	1,090.3	12.2
8	Triumph-Adler	W. Germany	631.6	15.0
9	Racal	U.K.	525.8	30.0
10	Mannesmann Kienzle	W. Germany	343.0	21.3
11	BASF	W. Germany	298.2	21.4
12	Plessey	U.K.	290.0	14.8
13	Thorn EMI	U.K.	267.3	28.2
14	Ferranti	U.K.	266.0	36.2
15	Rank Xerox	U.K.	236.0	30.1
16	Cap Gemini Sogeti	France	206.0	28.6
17	Nokia	Finland	181.0	28.8
18	Scicon	U.K.	173.3	41.4
19	Cisi	France	171.6	16.0
20	Norsk Data	Norway	166.7	53.7

METHODOLOGY

For this survey, Europe includes Austria, Belgium, Denmark, Finland, France, West Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, and the U.K. The survey definition of data processing includes mainframes, minicomputers, microcomputers, office systems, data communications, peripherals, software and services, and maintenance and repair. Excluded are data transmission from specialized common carriers, electronic and mag card typewriters; electronic cash registers; instrumentation devices; test equipment; semiconductors; printed circuit boards; and dp supplies, except for magnetic media for disks and tape drives. For computer-based manufacturing systems, such as computer-controlled machine tools, only the computer and hardcopy output devices are included.

All revenue and earnings figures have been adjusted to calendar year calculations. All the European company figures were converted to U.S. dollars, using OECD exchange rates. The main table shows growth rates in actual accounting currencies (AAC) to compensate for fluctuating exchange rates. For accuracy, some 1983 figures have been restated and appropriate adjustments made in the rankings.

THE DATAMATION EUROPEAN 25

1984 RANK	1983 RANK	COMPANY	HEAD-QUARTERS	1984 ERP. DP REV. ($ MIL.)	% CHANGE ($ MIL.)	% CHANGE (AAC)
1	1	**International Business Machines**	U.S.	10,984.4	5.9	5.9
2	2	**Siemens AG**	W. Germany	2,092.1	4.5	16.8
3	4	**Ing. C. Olivetti & Co. S.P.A.**	Italy	1,504.6	6.2	23.1
4	5	**Digital Equipment Corp.**	U.S.	1,464.1	29.0	29.0
5	3	**Groupe Bull**	France	1,440.5	1.8	16.8
6	8	**LM Ericsson**	Sweden	1,011.0	15.6	24.7
7	11	**Hewlett-Packard Co.**	U.S.	992.0	36.2	36.2
8	7	**Nixdorf Computer AG**	W. Germany	975.3	3.1	20.7
9	9	**Burroughs Corp.**	U.S.	967.5	12.5	12.5
10	6	**ICL**	U.K.	917.0	−4.6	8.3
11	10	**N.V. Philips Gloeilampenfabrieken**	Netherlands	839.5	−.4	12.2
12	12	**Sperry Corp.**	U.S.	799.0	13.0	13.0
13	13	**NCR Corp.**	U.S.	707.7	1.0	1.0
14	15	**Wang Laboratories Inc.**	U.S.	435.7	37.3	37.3
15		**Commodore International Ltd.**	U.S.	406.6	92.4	92.4
16	14	**Control Data Corp.**	U.S.	375.0	7.0	7.0
17	16	**Mannesmann Kienzle GmbH**	W. Germany	343.0	8.5	21.3
18		**Apple Computer Corp.**	U.S.	315.1	75.0	75.0
19	18	**Honeywell Inc.**	U.S.	310.2	9.5	9.5
20	17	**Plessey Co. plc**	U.K.	290.0	1.0	14.8
21	19	**Thorn EMI plc**	U.K.	242.7	12.7	28.2
22	21	**Rank Xerox**	U.K.	236.0	14.6	30.1
23		**BASF**	W. Germany	228.1	8.6	21.4
24	22	**Ferranti plc**	U.K.	226.6	19.8	36.5
25	25	**Data General Corp.**	U.S.	220.1	34.4	34.4

NA: NOT AVAILABLE

Italian lira, down 15.7%, the French franc, off 14.7%, and the British pound, down 13.7%. Most of the other European currencies, including the German mark, fell by about 12%.

Once again the U.S. vendors dominate the field, winning 12 slots on the European 25 table. The European contingent includes five U.K. companies, four German firms, and one company each from France, Italy, the Netherlands, and Sweden. Among the five frontrunners are two American firms, IBM and DEC, which also hold the number one and number two positions in the DATAMATION 100 (see "A Global Industry. The DATAMATION 100," June 1, p. 36).

Coming in a distant second to IBM is Germany's giant, Siemens, which is followed by Italy's national dp hero, Olivetti. Falling two notches below Olivetti is France's dp flagship, Bull, which dropped two places in the 1984 ranking.

All of these national dp powerhouses earned top positions on DATAMATION's list of leading European companies that are ranked by worldwide dp revenue (Fig. 2). Seven of those firms are not included on the main table because their European dp turnover falls below the $220 million cutoff point.

The companies in this category are Triumph-Adler, Racal, Cap Gemini Sogeti, Nokia, Scicon, Cisi, and Norsk Data. The inclusion of Cap Gemini Sogeti, Scicon, and Cisi in that worldwide leadership league reflects the expansion of the European software and services market. Last year revenues in that market rose 20% to roughly $13 billion.

Last year Thorn EMI, which gets most of its revenues from software and services, chipped in $133 million for chip maker Inmos and took over software house EPS Consultants. This teamup trend was very much in evidence in Europe last year, especially in the telecom field. In March AT&T, through its corporate arm around Olivetti, took a 25% stake in the born-again Italian office systems company. In Denmark ITT acquired the financially troubled Christian Rovsing, while in Britain, Standard Telephone & Cables took over ICL for $540 million in August.

MERGING OF TWO BEHEMOTHS

The Dutch Philips would also have made a major acquisition if it could have found a suitable mini maker to prop up its product line. Instead, it spent the year forging links with Control Data to market optical storage systems and with Siemens to develop new semiconductor technology under the Mega project.

Like Siemens, Philips is a huge electronics group that has traditionally been about as streamlined as a brontosaurus and about as fast to react to change. Both behemoths have overhauled their operations, merging their computer and communications divisions. While Siemens is pinning its hopes on its Hicom PBX, Philips is counting on its Sophomation (Synergistic Open Philips Office Automation) net products that are based on open networking concepts.

Rallying around the International Standards Organization's open systems in-

TOTAL DP REV. ($ MIL.)	% CHANGE ($ MIL.)	1984 TOTAL REV. ($ MIL.)	ERP. DP REV. AS % OF TOTAL DP REV.	DOM. REV. AS % OF TOTAL DP REV.	DP REV. AS % OF TOTAL REV.	NET INCOME ($ MIL.)	1984 EMPL.	FISCAL YEAR END
44,292.0	21.3	45,937.0	24.8	59.6	96.4	6582.0	394,930	Dec
2,789.5	−1.1	16,076.8	75.0	55.0	17.3	374.0	319,000	Sept
2,012.4	10.7	2,605.6	75.0	39.5	77.2	202.6	47,613	Dec
6,230.0	29.0	6,230.0	23.5	65.0	100.0	487.0	88,600	June
1,555.6	1.8	1,555.6	92.6	63.4	100.0	−55.9	26,435	Dec
1,123.3	15.6	3,545.1	90.0	28.0	31.6	53.7	70,000	Dec
3,400.0	36.2	6,297.0	29.2	61.0	53.9	665.0	80,000	Dec
1,147.4	7.9	1,147.4	89.0	49.0	100.0	42.4	20,190	Dec
4,500.0	12.5	4,875.6	21.5	59.0	92.3	244.9	65,000	Dec
1,222.7	−4.6	1,222.7	75.0	57.0	100.0	18.7	15,167	Dec
1,090.3	−0.4	16,766.0	77.0	12.5	20.8	346.0	344,000	Dec
3,473.9	13.0	5,370.0	23.0	70.0	64.7	267.6	77,000	Mar
3,670.0	10.1	4,074.3	21.0	55.7	90.0	342.6	62,000	Dec
2,420.7	35.0	2,421.1	18.0	71.2	99.9	230.7	30,000	June
1,129.5	21.8	1,189.5	34.2	60.0	94.9	100.3	NA	June
3,755.5	7.0	50,269.9	10.0	82.0	74.7	31.6	54,100	Dec
343.0	8.5	428.1	100.0	79.0	80.1	104.3	8,000	Dec
1,897.9	74.9	1,897.9	16.6	78.0	100.0	104.3	5,382	June
1,825.0	9.5	6,073.6	17.0	74.0	30.0	239.0	94,300	Dec
290.0	1.0	1,953.1	100.0	68.0	14.8	127.9	38,838	Dec
267.3	7.3	3,761.2	90.8	82.0	7.1	120.8	91,544	Mar
236.0	14.6	2,353.3	100.0	NA	10.0	112.0	31,000	Oct
298.2	8.6	12,392.0	76.5	NA	2.3	NA	31,000	Dec
266.0	19.8	666.7	85.0	74.0	39.8	38.4	11,087	Dec
1,229.7	40.9	1,229.7	17.9	70.1	100.0	78.4	17,695	Sept

terconnection (OSI) standards, the major European firms banded together last year to fight their fiercest competitor, IBM, and its SNA networking solution. Among the OSI support group are Philips, Siemens, Olivetti, Bull, Ericsson, Nixdorf, and ICL.

Three of these OSIers—Bull, ICL, and Siemens—also joined forces last year to form the European Computer Research Center (ECRC), which will explore artificial intelligence (AI) research. The group hopes this research will result in products that they can use to protect their home markets, which have been dented by Big Blue. So far, however, ECRC progress has been slow, due to personnel shortages and the mutual indecision of the three sponsors.

The various national AI research projects also began to get under way last year. There was Alvey in the U.K., Konzept in Germany, and sundry research schemes in France. The European Economic Community (EEC) also ended the pilot phase of its $1.5 billion Esprit program, which is 50% funded by European governments. With one high-profile project under its bureaucratic belt, the EEC is now working on another ambitious effort, the Research for Advanced Communications in Europe (RACE) program. The purpose of the plan is to develop a Europeanwide integrated services digital network (ISDN), which will help standardize telecom equipment and open up PTT-protected markets.

Such schemes are not only aimed at building local technological muscle, they are also designed to foster the concept of a united Europe. While these programs promise numerous benefits in the long run, in the short term they do little to help local firms that are finding it tough going in the European market.

Companies around the world are seeking new markets and new technologies and techniques to penetrate those markets. Foremost on that list are Japanese vendors. Still absent from the top 25 rankings, Japanese companies have gone the partnership route in Europe. Last year Bull signed a deal to distribute NEC's high-end mainframes. Meanwhile, BASF and Olivetti have been peddling Hitachi mainframes for years, and both ICL and Siemens have been selling big Fujitsu systems. In fact, Fujitsu was working with ICL last year to develop two new mainframe lines. The Japanese company also took a majority stake in Spanish dp firm Secoinsa in 1984.

The Japanese have yet to make any direct inroads into the European dp domain. Given their export drive and marketing skills, it may only be a matter of time before they come knocking on Europe's front door. The Americans, and certainly IBM, are already there. That Yankee contingent may be missing two members next year, since both Commodore and Apple may fall off the European top 25 chart as a result of slumping micro market sales.

Economic and market conditions could also turn things sour for European dp companies. Feeling the squeeze from vintage vendor IBM, these homegrown firms proved this year that they will not settle for the dp dregs in Europe. Next year's DATAMATION European 25 survey will show just how successful they've been in harvesting those hopes. ®

A look at the expanding universe of on-line transaction processing applications.

EXPLORING THE OLTP REALM

by Omri Serlin

Sophisticated market research is not required to convince anyone that computers are deeply ingrained within the structure of today's business enterprises. It has become nearly impossible to complete a business transaction without the involvement of some computer somewhere. One has only to think of one's latest interaction with a travel agent, bank teller, automatic teller machine, telephone directory assistance operator, or retail store clerk to realize how far this process has progressed.

Since the mid-1960s, on-line applications have been consuming a progressively larger share of the processing power represented by all new shipments of mainframe and medium-scale computers. The proportion of such systems intended exclusively or partially for on-line work is already well over 50% by some estimates, and is projected to reach 75% before the end of the decade.

On-line transaction processing (OLTP) is the name commonly used to describe applications in which a common database is available to interactive terminal users for both inquiries and updates. The database in such applications is a representation of some aspect of the business; a transaction is a representation of an activity (e.g., receipt of an order) that may transform the database from one state to another, or which may result in merely displaying some information about the state of the business.

OLTP is fundamentally different from the so-called interactive computing or the timesharing systems of the 1960s and 1970s—although, with users hunched over terminals, it does resemble them superficially. Timesharing systems attempt, through architectural artifices and specialized operating systems, to create the illusion that each user has access to a completely independent, private computer. OLTP systems, on the other hand, are created explicitly to allow concurrent, on-line sharing of common databases by multiple users.

Unlike early users of timesharing systems, who would probably be regarded today as hackers or computer technology enthusiasts, most users of OLTP systems regard the computer as a business tool and care little about the underlying technology. This is key to the expansion of the OLTP market—just as the dramatic expansion of the desktop microcomputer market occurred when business software supplanted kits for tinkerers.

The earliest large-scale OLTP systems were the airline reservations systems of the mid-1960s, which were expanded later to include such functions as crew and equipment scheduling. In the mid-1970s came other reservation systems for hotel/motel and car-rental agencies; large-scale banking applications, such as demand/deposit teller support, automatic teller machines (ATMs), and electronic funds transfer (EFT); credit authorization systems; and trading and brokerage systems.

Today, the acceptance of OLTP systems is rapidly spreading to the manufacturing segment, where JIT (just-in-time) disciplines and paperless factories are dependent on the computer for their minute-by-minute operations. Even such classical back-room functions as billing and inventory control are rapidly being converted to on-line operations with strong OLTP characteristics. Many editorial support systems in large newspapers and magazines have an OLTP flavor, as do some hospital management systems that combine clinical and administrative support.

IBM IS USED BY MOST

By far the majority of OLTP applications today are being implemented with IBM large-scale 308X mainframes (see Fig. 1). The two key software elements usually involved are CICS and IMS. The venerable CICS (customer information control system), despite its age, is still used in nearly 70% of all large IBM installations, according to an August 1984 survey. CICS provides centralized terminal management and applications scheduling for OLTP applications.

IMS, of course, is IBM's main database offering; its data communications (DC) facility is sometimes used to implement OLTP applications. IMS/Fastpath is a specialized, OLTP-oriented database subsystem that offers higher transaction throughput, but at the cost of reduced functionality. Among minicomputer makers, DEC, Hewlett-Packard, and Prime are probably the leading suppliers of transaction processing equipment.

A budding application with substantial (though so far unfulfilled) potential is generically known as videotex. Originating in the U.K., videotex was meant to provide consumers and small businesses access to useful databases (e.g., airline and railway schedules) by relying on an augmented tv set as a terminal, using the public telephone network as the communications medium. Despite a number of promising experiments, the idea never caught on in the U.S., where the popularity of desktop microcomputers preempted the need for the tv set.

Rather than provide for inquiries only, videotex efforts in the U.S. are now focused more on transaction services like home banking. Notable in this respect is the recently formed partnership between Bank of America, Chemical Bank, AT&T, and Time Inc., which plans to offer homes equipped with a personal computer access to banking services, a discount stock brokerage, and teleshopping.

In the telephone system, the computers that now control many central office switches (and indeed those within modern PBXs too) may be regarded as rudimentary on-line transaction processing systems. More complex on-line transaction functions are rendered by the directory assistance systems the operators use and the

ILLUSTRATION BY ANDREA BARUFFI

The airline reservations systems remain the archetype of OLTP applications.

FIG. 1

ESTIMATED OLTP MARKET SIZE

WORLDWIDE SHIPMENTS BY U.S. MFGS.—HW/SW/PERIPH (NO SERVICE) • ADJUSTED FOR CALENDAR YEAR • $ BIL.

	CY 1982	CY 1983	CY 1984	CY 1989
IBM	10.8	14.2	17.6	28.3
BUNCH & PCMs	5.5	6.5	7.9	12.7
Minis	2.2	3.1	4.7	9.4
FT Suppliers	0.3	0.4	0.5	1.8
Total	18.8	24.2	30.7	52.0

FT SUPPLIERS ($ MIL.)

	CY 1982	CY 1983	CY 1984	CY 1989
Tandem	310	387	474	1,390
Stratus	5.5	20	40	320
Others	—	—	5	50
Total	315	407	519	1,760

Source: ITOM International Co.

systems that support toll-free calling.

Promising future applications with varying OLTP content include value-added communications networks; support of automatic point-of-sale (POS) retail systems like automated gasoline pumps; and the emerging work group computer or file-server application, where a small multiuser system supports electronic mail functions and possibly other common databases in the office environment (see "Departmental Computing: A Choice of Strategies," May 1, p. 86).

Airline reservations. In many ways, the airline reservations system remains the archetype of OLTP applications: it has to support a large number of users, must allow concurrent updates to a large database, must be up and available around the clock and year-round, and is at the heart of the business its serves.

In an airline reservations system, the common database, representing the inventory of available seats on various flights, is made accessible to travel agents using interactive terminals. The agents can make various inquiries against the database (such as which flights operate between two cities on a given date on or about a given hour, and what class seats are still available). Then the agent can make an actual booking, which involves on-line database updates—reducing the number of available seats on a given flight by the number booked, and creating a related passenger name record (PNR) containing such information as the passenger's name and phone number. A booking cancellation also results in a database update.

Although Sperry Univac was initially a contender in the airline reservations business, virtually all major systems currently in use (American Airlines' SABRE, United Airlines' Apollo, TWA's PARS) use IBM large-scale mainframes. In cooperation with the airlines, IBM developed ACP (Airline Control Program), an operating system specialized to achieve the high transaction throughput required by the reservation application.

ACP, now renamed TPF (for Transaction Processing Facility), is being offered to other industries as well. At the Bank of America, for example, the latest TPF version (TPF2) is the basis of a new on-line teller support system now under development.

MASSIVE VOLUMES TYPICAL

The airline reservation application is characterized by massive amounts of disk data, a large number of terminals, and high transaction volumes. The TWA system, for example, which is the smallest of the big three noted above, runs on a 9083 system (a specially modified version of the 3083 mainframe), uses 144 300MB disk drives, supports some 12,000 terminals, and handles peak loads of over 200 messages per second. (A message, the basic transaction in this system, involves execution of about 20,000 to 25,000 instructions and more than nine DASD accesses.)

Telephony-related applications. At about the same time the airline reservations systems were being installed, AT&T in the U.S. and the PTT in France began installing computerized central office switches in their respective telephone systems. The computer in such systems is involved principally in call setup: it determines the routing for the call and creates a connection by setting parameters into the switching apparatus. It must be able to handle a large volume of such transactions, and must be highly available. In these respects, it is rather like an OLTP system.

This application is not typical OLTP, however, because it does not involve a database and it does not require the computer to remember contexts; an interrupted call is simply lost, and the parties must redial to establish a connection. Logging is used merely as the basis for billing. In contrast, an OLTP system must keep careful logs in order to be able to back out of transactions or roll forward the database. (Roll forward is explained later in this article.)

In the U.S., AT&T developed a series of fault tolerant (FT) processors for service in central office switching applications. The 3B20D is the latest in the series: it was first offered to the public in March 1984. One notable application with some OLTP flavor is the 800 calling system, which is serviced by a network of 3B20D computers. Here, toll-free numbers dialed by subscribers must first be translated to the correct area code and number of the destination.

The telephony-related application with the strongest OLTP character is the directory assistance support (DAS) system, supplied chiefly by Computer Consoles, Rochester, N.Y. This system allows multiple operators to retrieve telephone numbers by subscriber names or other keys. It offers high availability and fast response time by replicating the database up to eight times.

Banking and financial applications. Since the mid-1970s, banks have been installing OLTP systems at an increasing pace. The most visible of these systems support teller activities, which are principally concerned with demand/deposit (checking) and small savings accounts. Banks have been automating depositors' account handling and other aspects of their operations for at least 25 years now, but the complete on-line handling of account transactions is only now becoming the accepted norm.

For example, in 1977 the Bank of America installed a multiple minicomputer system to help 10,000 tellers in 1,200 branches administer 10 million customer accounts. In each of the bank's two processing centers (Los Angeles and San Francisco), a network of 32 minicomputers acts as a front end to large IBM mainframes, where account information is held. Every morning the account status is loaded into

The early OLTP systems for the first time allowed many users to concurrently access and update the same data.

the mini system; during the day, most teller transactions involving debits or credits to the accounts are merely captured on-line. At night, the transactions are processed in batch fashion by the main computers to update the account information. At this point the bank is engaged in a project that will replace this system with a more integrated one based on IBM's TPF2 software. Other, smaller banks have already implemented such integrated on-line teller support systems, some using Tandem equipment.

DEMANDS MORE SEVERE

In many ways, the demands of the financial OLTP environment are far more severe than other OLTP applications. There is a need to maintain absolute accuracy (in account balances, for example), despite concurrent update activities and, possibly, hardware failures.

The explosion in new customer services, including local, regional, and national ATM networks, is increasing the demand for OLTP systems in the banking industry. Such services are being spurred by increasing competition due to deregulation, as well as by the need to reduce costs (e.g., replacing manned branches with ATMs).

Manufacturing. Despite increasing use of computers in planning (manufacturing resource planning, or MRP) functions, much of the actual running of a discrete-process production plant is still paper-controlled and often characterized by batch-style operations, where blocks of raw materials are converted to end-products as a group.

Increasing attention is now being focused on shop floor control and other systems involved in the minute-by-minute operation of such plants. The concept of a paperless factory is rapidly gaining acceptance. In such factories, the paperwork accompanying each product or batch is replaced by a combination of bar-code stickers and information entered through terminals located in the various work areas. The systems supporting paperless factories are prime examples of the application of OLTP technique in the manufacturing environment.

Because of increasing concerns regarding industrial productivity, such systems have been funded more aggressively in the past few years, and are likely to continue to be the focus of substantial interest. These systems save time once lost to form filling; provide up-to-the-minute reports on the status of plant, inventories, and finished goods; and can be used to pinpoint sources of production problems earlier than before. The adoption of JIT inventory disciplines virtually mandates the use of on-line control systems.

Tandem Computers, the leading supplier of fault tolerant systems for OLTP service, is mounting a major campaign to place its systems in manufacturing applications. Tandem practices what it preaches: its plant in Austin, Texas, which manufactures the NonStop EXT computer and a variety of terminals, is one of the early examples of a paperless factory. Similar and related systems are being installed in other Tandem manufacturing plants.

In Austin, bar-code stickers attached to pc boards are used at the test stations to automatically download the appropriate test program. All of the tracking of materials flow, from receiving and stocking through processing and shipping, is based on bar-code identification at each work stage. (In the terminal products, the plant also employs innovative work disciplines, under which each worker is responsible for assembling a complete product, as well as for testing and reworking if necessary; there are no inspectors as such.) Naturally, the plant's control systems run on Tandem gear.

At Apple's famed Macintosh plant in Fremont, Calif., which tried to enforce the JIT discipline and originally utilized highly automated material movement systems (some of which have since been removed), a Tandem system now supports the key management information system. Although this system is not yet on-line, there is a plan to move in that direction. The plant employs a paperless rework facility based on an HP 1000 minicomputer.

Fault tolerance and availability. The spread of OLTP systems, beginning with the airline reservations systems, brought to the fore some concerns about the reliability of computer systems. Previously, computer downtime affected just a small number of back-room workers who were typically engaged in after-the-fact record-keeping.

OLTP AT HEART OF BUSINESS

By contrast, OLTP systems are frequently at the heart of the business; a disruption in system operation can forcibly idle many employees and possibly halt important services that customers rely on. An airline with an inoperative reservations system can't book new business; a bank with inoperative ATMs is antagonizing its customers.

The impetus for the development of commercial FT systems came chiefly from such concerns. (It should be added that in the mid-1960s, fault tolerance was also important in the space program, various military aerospace projects, and in the computerization of the telephone network in the U.S. and in France. These efforts were principally focused on cpu and memory redundancy techniques, however; they did not deal with database robustness or concurrency and consistency issues, and hence contributed only marginally to today's commercial FT systems for OLTP service.)

Some of the key ingredients of today's FT systems were first developed and tested in the airline reservations systems. Among these are disk mirroring, or shadowing, a scheme by which the system undertakes to maintain a mirror image of critical disk data by automatically replicating every write to a second, physically separate drive. This assures that the critical portions of the database are physically accessible even after a disk drive failure. This capability was implemented in early versions of IBM's ACP.

TRAVEL AGENTS' DILEMMA

The early OLTP systems for the first time allowed many users to concurrently access and update the same data. This focused attention on a new problem: how to assure data consistency in the face of concurrent updates. For example, if two travel agents wish, at about the same time, to book two different passengers on a given flight, they may both first read the current status (N seats available) and modify it by computing the new balance, N-1. Both write back this new balance, resulting in an inconsistent inventory: N-1 instead of N-2.

The most common solution for this type of problem is to serialize the concurrent accesses by means of file and record locks, also an early feature of ACP. Thus if the agent's transaction intends to modify the seat inventory, a lock is placed on the relevant flight record to prevent anyone else with similar update intent from reading the seat status until the first agent is through.

As it turns out, the airline reservations environment is not overly sensitive to this particular consistency issue, if for no other reason than the fact that airlines practice flight overbooking to counter no-shows. Data consistency became a key concern in the mid-1970s, when the banking and financial communities began implementing large-scale OLTP systems.

While in other OLTP systems slight variances between the computer's database and the real inventory situation, for example, are acceptable, in the banking environment such variances are intolerable. A bank can't tell a customer his current balance is approximately so many dollars; ex-

The explosion of new customer services is increasing the demand for OLTP systems in the banking industry.

actitude is of the essence.

How does one protect this exactness requirement in the face of possible computer failure? For example, suppose the system crashed in the middle of executing a transaction that takes money from one account and puts it into another. The database is now inconsistent, since the money is missing from the source account but isn't yet reflected in the recipient's account.

The concept of atomic transactions originated as a response to this and similar problems. Atomicity is a property of the system under which the user may define a sequence of related database actions (by, for example, bracketing the sequence with "BEGIN TRANSACTION" and "COMMIT" commands); the system undertakes to guarantee either that all such actions will be effected or that none will.

There are various ways to achieve this guarantee. Perhaps the most popular is the write-ahead log technique, in which the before and after images of the affected records are first written to a mirrored disk log file. If the system is successful in then implementing these changes in the actual database, a success record is added to the log file.

If the processor or the system crashes in the middle of such actions, the system can examine the log file upon being restarted; those transactions not successfully implemented (detected by the absence of the success record in log file) can be undone by using the before and after images. As long as one copy of the log file and the database remain intact, any number of system failures can be compensated for by repeating this transaction-backout process, which removes the effects of incomplete transactions.

Such facilities are now becoming common in most transaction-oriented systems. IBM's IMS and CICS have had them for a while, as has Tandem's Encompass, and Hewlett-Packard recently incorporated transaction backout in its Turboimage DBMS. But fault tolerant systems, which feature multiple processors, can perform such transaction backout actions essentially on-line, whereas a conventional uniprocessor system typically has to be manually restarted before attempting transaction backout.

Roll forward is a more drastic database recovery technique that is needed when the current on-line database is lost, because, for example, of a disk drive failure or double disk drive failure in mirrored disk situations. Here the system periodically dumps the database to an off-line tape; after a crash, the system can input the most recent dump, and use the log file to redo all the transactions that were successfully committed since that dump.

Tandem Computers, Cupertino, Calif., has been the premier supplier of FT systems for commerical OLTP applications since it began shipping some 10 years ago. The company quickly grew to become a Fortune 500 member, with revenues of over $600 million projected for the fiscal year ending September 1985. The Tandem multiprocessor system can restart failed processes through a checkpointing scheme and supports the full range of database integrity and consistency measures, including some that apply in distributed environments.

STRATUS ANOTHER SUCCESS

Stratus Computer, Marlboro, Mass., is another successful supplier of commercial FT systems. Launched in 1980 and still much smaller than Tandem in terms of revenues (projected to exceed $70 million in 1985), Stratus's growth rate will have averaged over 100% a year since shipments began in 1982. Furthermore, earlier this year, Stratus concluded an unprecedented agreement with IBM, under which the giant firm obtained the right to resell the Stratus system under its own logo. The program is still highly tentative; general availability from IBM will depend to a large extent on favorable reactions from a number of test sites. Regardless of the actual volume of shipments, though, the prestige of being the first computer supplier to IBM is valuable in itself.

While IBM's involvement with Stratus is interesting and significant, it is not nearly as fraught with strategic consequences as some analysts have suggested. IBM is a large, diverse organization, which in recent years has delegated more and more responsibilities to its various product divisions and adopted increasingly aggressive tactics. The Stratus agreement came about as a result of one such division's perception of what it needed to serve its customer base. There are some indications, however, that the Stratus move has served to focus attention on the issue of fault tolerance within IBM, and that the company is making some attempt to centralize at least the marketing and support functions for its diverse high-availablity efforts.

Some in IBM are not convinced that fault tolerant hardware is required for high availability. They have been claiming, for example, that some 308X installations have never experienced a TCM failure. (TCM, thermal conduction module, is the basic package of chips from which the 308X systems are built.) Field data collected by Reliability Research, Stamford, Conn., and reported in the author's *FT Systems* newsletter supports this claim, and indicates that IBM 308X cpus enjoy mean time between failures (MTBFs) of 1.9 to 3.4 years—substantially better than an Apple desktop micro. Nevertheless, customers evidently want more; in response, IBM plans to unveil in 1986 the extended reliability feature (XRF) for IMS. XRF is an enhancement to IMS that will allow two IMS-running systems to act as an on-line/hot backup pair, and to automatically switch roles on a failure in the on-line system.

A host of would-be FT suppliers, launched at about the same time as Stratus, have encountered substantial product development and financing problems (see "Fault Tolerant Blues," March 15, p. 82). Still, some are likely to survive and reach production status, although possibly not as independent entities.

Performance considerations. Measuring the performance of OLTP systems is important for both capacity planning and for comparing various vendors' offerings prior to procurement. Such comparisons have always been a subject of controversy even with conventional computer systems, and are even more difficult in the OLTP environment.

Whetstones, MFLOPS, and MIPS are not very meaningful in the OLTP environment. They tend to measure the raw cpu performance, completely ignoring the three most important factors that affect the performance of OLTP systems: system software capabilities, I/O efficiency, and the impact of communications protocols. They also do not properly reflect the capabilities of multiprocessor systems, which are especially popular in OLTP and FT applications.

MEASURING HOW OLTP PERFORMS

A much better measure of OLTP performance is the tps (transactions per second) rating. A number of OLTP system suppliers, including Tandem and Stratus, are now routinely reporting results of benchmarks in terms of tps. The difficulty is that just as there is no standard way to define an average instruction for a MIPS calculation, the average transaction is equally elusive. Yet the definition of what a transaction does is crucial if tps figures are to have any merit as comparative performance indexes.

For example, a transaction representing a bank withdrawal or deposit may involve four to six database accesses, some of which may require locking one or more records. With a teller and a customer waiting for a result, response time is obviously critical and must be factored in. In contrast, a transaction in, say, a gaming support system may involve pure logging; in

Data consistency became a key concern in the mid-1970s, when the financial community began implementing large-scale OLTP systems.

such an environment, many transactions could be logged to disk in one access. Clearly, tps figures from such widely differing applications are not comparable.

A notable first attempt to define a standard transaction benchmark has been described in DATAMATION ("A Measure of Transaction Processing Power," April 1, p. 112). That article is also notable in that it proposes a standard way to assign a cost factor to a tps, so that a user could actually make a meaningful tradeoff between performance and cost. The cost per tps for typical multiprocessor systems such as Tandem or Stratus runs about $50,000 to $100,000 per tps. Such systems can deliver about 1tps to 5tps per cpu under this benchmark. Large IBM mainframes can do perhaps 10 times better in terms of tps/cpu, but are not necessarily more cost-effective in terms of cost per tps. Unfortunately, not enough comparative data are yet available.

How many tps are enough? Much as batch systems gobble up MIPS, the OLTP market seems to have an insatiable appetite for higher tps capacities. A number of large customers, especially the airlines, financial institutions, and brokerage firms, already foresee the need for systems offering 1,000 or more tps. A key issue is whether architectures that rely on multiple low-powered processors can effectively serve such applications.

The reason for this concern is the well-known loss of performance due to multiprocessing overhead, which results in a less-than-linear performance increase as the number of processors is increased. Tandem, for one, is convinced that it can handle the task by locally interconnecting multiple systems of its top-of-the-line TXP multiprocessor over a fiber-optic network dubbed FOX. Preliminary benchmark results appear to support Tandem's claims that performance growth can be made nearly linear, both within TXP systems and across the FOX network.

IBM, on the other hand, appears to be placing its bets on TPF2 and large mainframes. While this combination is indeed capable of supporting high transaction rates, its chief weaknesses, as pointed out by competitors, are that it provides only rudimentary database facilities, requires the user to implement system services and applications in assembly language, and generally requires substantial customization and support.

Both approaches are likely to find favor for a while. Applications requiring very high transaction rates will continue to have to sacrifice functionality (i.e., a wide variety of file types and access methods) for performance. As hardware costs continue to plummet, and as basic system performance continues to improve, we will probably see high-functionality systems, such as IBM's IMS or Tandems' Encompass, begin to approach the high transaction rates currently possible only with highly tuned, minimum functionality systems. ●

Omri Serlin heads ITOM International Co., a research and consulting firm in Los Altos, Calif. He is preparing a book on on-line transaction processing systems, to be published by Prentice Hall. He also writes the *FT Systems* newsletter, which reports and analyzes developments in OLTP and fault-tolerant systems.

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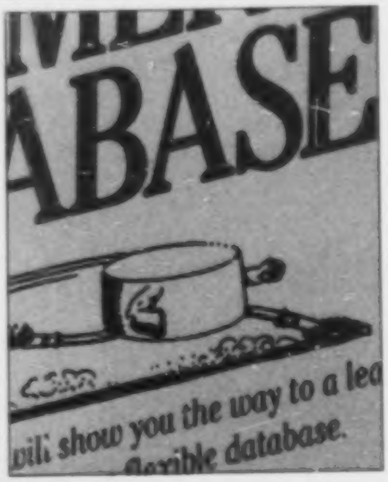
FEATURES

32
IN FOCUS

Computer industry workers are increasingly turning to drugs and alcohol. In "Getting Straight Again," Charles L. Howe reports on what steps are being taken to get the high out of high tech.

68
EMPOWERING PROGRAMMERS
John W. Verity

Desktop machines with a wide range of software development tools are transforming the programming task.


ABASE
vil: show you the way to a lea
flexible database.

83
LESSON ONE: DURABLE, DOABLE DATABASES
Frank Sweet

They're easy to implement and they outlive products, policies, and the powers that be. First of a 14-part series on database design.

88
THE SYSTEM UNDERSTANDS
Philip Edwards

In Ontario, an on-line IMS system manages motor vehicle registration for the Canadian government. It sees the world from the viewpoint of an automobile.

96
A PC POLICY PRIMER
by Ken Michielsen

Aware that micros and their users require management and support, many companies are establishing appropriate rules from A to Z.

103
THE DP PSYCHE
Michael L. Lyons

Computer folk are, in some undefined way, different from the rest of humanity. An international survey of industry professionals may begin to explain why.

NEWS IN PERSPECTIVE

42 **MAINFRAMES**
Time to think again.

44 **INTERNATIONAL**
Can data be taxed?

50 **MICROCOMPUTING**
P-System poops out.

54 **SOFTWARE**
Panacea or placebo?
Picking up the pieces.
Let's see it in writing.

62 **BENCHMARKS**

DEPARTMENTS

8 **LOOKING BACK**
13 **LOOK AHEAD**
18 **CALENDAR**
23 **LETTERS**
29 **HARDCOPY**

115 **HARDWARE**
121 **SOFTWARE**
124 **ON THE JOB**
127 **READER'S FORUM**
128 **ADVERTISERS' INDEX**

OEM SUPPLEMENT 64-1

-2 **SUPERMICROS ASCEND TO 32 BITS**
-11 **THE TOP 10 VARS**

COVER ILLUSTRATION BY JAMES TENNISON
PHOTOGRAPH BY LAWRENCE DOCKERY

Tough to define, this $4.2 billion market will continue to grow in some form at 30% a year.

SUPERMICROS ASCEND TO 32 BITS

by Lamont Wood

Depending on who one talks to, the supermicro market is either the wave of the future or already dead and buried. The market's backers point to the promise of 32 bits on a desktop, now being realized, and the potential of the more powerful computers to offer better performance at lower prices. Its critics say that IBM Corp.'s PC AT will dominate the field, that local area networks will provide supermicros with increasing competition, and that effective distribution channels will be hard to come by. Those who downplay supermicros say the word itself can't even be defined anymore—although somebody sold nearly a quarter of a million systems in [illegible]84 that weren't pcs, minis, or mainframes.

There seems to be a general consensus, however, that if the term must be defined, it means multi-user microcomputers with the latest processors. No one seems comfortable discussing graphics workstations or machines like Apple Computer Inc.'s Macintosh under the supermicro heading, even if these devices do use the same chips.

Market research firm Dataquest Inc. of San Jose lists a total 1984 market of more than 230,000 systems with an if-sold value of $4.2 billion (see Fig. 1). The figures refer not to supermicros, though, but work-group computers—systems that support two to 10 users, a definition Dataquest prefers. Still, the work-group market probably includes most of the supermicro market.

Analysts agree that IBM's 1984 introduction of the AT has confused the market. "Before the AT came along, the supermicro category was well defined," says Ken Bosomworth, president of International Resource Development Inc., a research firm in Norwalk, Conn. "There were 40 to 50 makers of machines that ran from $8,000 or $9,000 on up. But now the AT is more powerful and cheaper than what they offered. The 1983 figures are the last ones that made sense." Adds George Colony, president of Forrester Research Inc. in Cambridge, Mass., "It is difficult to refer to any machine by size anymore."

Others say they can discern a market, however. "We define supermicros as multi-user micros that cost less than $20,000 at entry level and have an industry standard processor chip and open architecture," says Jocelyn Young, senior researcher with Future Computing Inc. in Dallas. And for Creative Strategies International of Cupertino, Calif., a supermicro is "a full 32-bit cpu that can be used in serious office automation," notes Tim P. Bajarin, vice president of microcomputer research at the firm.

But insisting on 32 bits in the supermicro definition may be premature since true 32-bit standard chips like Motorola's 68020 and Intel's 80386 haven't quite arrived, cautions Omri Serlin, editor of *Supermicro Newsletter* in Los Altos, Calif. Machines using the first of these semiconductors are just reaching the announcement stage, while the second chip isn't available yet.

But if the definition of a supermicro is stretched to include proprietary chips, then the enemy is already within the gates with true 32-bit micros like the AT&T 3B2 and the DEC MicroVAX II.

The 3B2 was released in March 1984 as part of AT&T's 3B product line, which reaches up into the higher supermini realms. The machine generally is counted as the supermicro member in the line because, as one AT&T spokesman notes, "it sits on a desk." The basic version with 512K of RAM and a 10MB disk drive costs $9,950. It has expansion slots for 16 terminals and runs Unix System V. And it uses the true 32-bit WE32000 chip, which was considered proprietary until AT&T began marketing it at the end of April.

Available since the beginning of 1985, AT&T's supermicro is not without problems, however. "We have offered the 3B2 since the first of the year, but sales have been limited by the availability of software," says Bruce Grant, manager of technical support for MicroAge Computer Stores Inc., headquartered in Tempe, Ariz. MicroAge is a chain of storefront sales organizations specializing in business computer and phone systems, with more than 150 stores nationwide. It carries several lines of supermicros.

RESULTS OF AT&T REVISIONS

"AT&T revised the operating system at the first of the year, just as the hardware was becoming available," Grant recalls. "They went from Release 1 to Release 2, adding file and record locking. It involved some PROM changes and new operating system software. We lost about 80% of the software that was available under Release 1. The vendors have had to recompile at least and in some cases to make major revisions.

"The 3B2 is not a VAX-like horsepower machine," adds Grant. "There is no hardware floating point and the disks are slow. But it's a good price-performance machine for accounting and database applications," he says. "The first round of application software for it was a disappointment due to hasty porting, but we were able to double the speed of some of it in-house."

Promising to make more of a splash is the MicroVAX II from Digital Equipment Corp. Released in May, the supermicro is the new low end of the VAX product line, which stretches all the way up to the VAX 8600.

Supporting up to 14 users, the price of the MicroVAX II starts at $20,000. The machine is based on a proprietary DEC chip and is said to run three to four times faster than its predecessor, the MicroVAX I, which had a cpu board instead of a chip. It runs the complete VAX instruction set and a subset of the MicroVMS operating system, plus a version of Unix called Ultrix.

DEC, of course, considers the MicroVAX II the greatest thing since sliced bread. "It's the most significant move in the supermicro market in a decade," declares Frank Sebastian, systems marketing manager for DEC's Business Computer Group. Ready to agree with the manufacturer is

3-D ILLUSTRATION BY NICK ARISTOVULOS; PHOTOGRAPH BY SHIG IKEDA

If the definition of a supermicro is stretched to include proprietary chips, then the enemy is within the gates.

FIG. 1

TOP 10 SUPERMICRO VENDORS IN 1984

COMPANY	REVENUES ($ MIL.)	MARKET SHARE (%)
Burroughs	545.7	13.0
Altos	243.2	5.8
NCR	178.4	4.2
TeleVideo	176.3	4.2
Fortune Systems	137.5	3.3
Tandy	124.8	3.0
Compupro	124.3	3.0
DEC	83.2	2.0
Molecular	77.6	1.8
Cromemco	74.6	1.8
Others	2,442.4	58.0
Total	4,208.4	

The 1984 market for systems with two to 10 users, based on if-sold value.

COMPANY	UNITS	MARKET SHARE (%)
Burroughs	42,825	18.6
TeleVideo	19,250	8.3
Altos	18,815	8.2
Tandy	14,545	6.3
Fortune Systems	14,015	6.1
Compupro	12,750	5.5
NCR	12,400	5.4
Cromemco	6,725	3.0
DEC	6,378	2.9
Onyx	5,700	2.5
Others	77,292	33.2
	230,695	

The 1984 market for systems with two to 10 users, based on units shipped.

Source: Dataquest

Neil Baldridge, vice president of Compu-Share Inc., an oem in Lubbock, Texas.

Shortly after the MicroVAX II was announced, Baldridge went to DEC headquarters where he ran his company's accounts receivable software package on the new machine and on both the DEC 11/780 and 11/750. To simulate multiple users, Baldridge used machine-driven input through two ports.

"I was really astonished at how fast it was," Baldridge said. "I thought, 'Oh, sure,' when they said it was in the 11/780 class. But with slow 5.25-inch drives, compared to the high-speed drives on the 11/780, it was 75% the speed of the 11/780. With faster disks, it should approach 85%. And it ran rings around the 11/750, which operated at 60% of the speed of the 11/780. For one-fifth to one-tenth the price," he continued, "you have nearly 80% the performance. We could replace the hardware we have here for a fraction of the original cost."

THE FIRST 68020 MACHINE

As for generic 32-bit chips, the first 68020-based machine to be announced appears to be supermicro from Masscomp of Westford, Mass. A 16MHZ cpu and memory upgrade board for its 500 Series of computers for the scientific and oem market, the device lists for $7,900. Still, "everybody's working on getting 32 bits," says Allan Wallack, Masscomp vice president. Depending on chip availability, the board probably won't be available until the first half of 1986, he added.

As a result, the first 32-bit supermicro built around a generic chip to reach the market probably came from Altos Computer Systems Inc. of San Jose. Using the 68020, the Altos 3068 was scheduled to be shipped in July. Designed for the oem market and running Unix System V, its price is listed at $7,000 in oem quantities (300 to 400 units). Included will be 1MB of RAM (expandable to 16MB), a 1.2MB floppy, a 20MB hard disk (expandable to 240MB), and a 60MB tape drive. The system can support 10 to 40 ports.

Altos also has a line of multi-user systems based on the Intel 8086 and its children. There's the 486 four-user system for $6,490, the 586 five-user system for $7,990, and the 986 nine-user system for $11,990. Most recently, the company introduced the 2086 20-user system for $19,990. For that price, the oem gets 2MB of RAM, an 80MB hard disk, a 1.2MB floppy, a 60MB backup tape drive, and one terminal. Based on an 80286, the supermicrocomputer can run IBM PC AT software, though it's not billed as an AT clone.

Elsewhere with established 16-bit chips, there's plenty of multi-user micro activity. One of the most active firms in this field is Tandy Corp.'s Radio Shack division, often cited as having the largest installed base of multi-user micros—perhaps as many as 40,000 systems—with its Model 6000 (known earlier as the Model 16). Running Xenix with an 8MHZ 68000, plus a Z80 chip for I/O handling, the 6000 can support up to six users. Its base price is $4,499 for a system with 512K RAM and two 8-inch diskette drives.

The attraction of multi-user micros is simple; the key is high-speed file sharing, claims Ed Juge, director of marketing planning at Radio Shack. While this feature is commonly available with multi-user systems, it's still not found on local area networks.

"With most network software, your file is locked, not just the record," says Juge. "With record locking, Joe can be changing inventory items 78 and 79, and I can be changing item 80. Under file locking, if Joe is changing something, I can't get in at all. But if I'm on the phone selling something and I see there's only one left in inventory, I want to make sure that Joe didn't sell it five minutes ago."

On the other hand, some vendors have been coming out with systems that look a lot like local area networks—multiuser clusters with a file server supporting slave pcs. Burroughs, for instance, offers the B25, which uses the 80186 and is oemed from Convergent Technologies of San Jose. A diskless workstation with 512K costs $3,195, and a workstation with a 20MB hard disk costs $7,600. The master unit—an XE 550 Shared Resource System—costs $21,000 with a 37MB hard disk.

"We've been very happy with the response time," says Dana Reiman, data administrator of materials systems at Boeing Aerospace Co. in Seattle, Wash. Reiman uses 21 clusters with the B25 and

Multi-user micros have a major advantage over LANs—cost. It's cheaper to buy terminals than pcs.

earlier B21 models. "We had trouble doing data entry for our mainframe using pcs for data collection, and we needed file sharing for administrative purposes," he explains.

But beyond record locking and related concerns, multi-user micros have another major advantage over LANs—cost. It's cheaper to buy terminals than pcs. Ron Wong, manager of office automation systems for Ford Motor Co. in Dearborn, Mich., where they installed 700 Fortune 32:16 processors with 2,000 workstations during the course of 1984, said cost was a major factor in their decision to get multi-user systems.

"At the time, we felt the multi-user systems looked better cost-wise," Wong recalls. "We wanted the ability to have electronic mail and file transfers, but the traffic in a lot of the smaller work groups wasn't enough to justify a LAN. And we wanted Unix for engineering purposes," Wong adds. "We've been quite pleased with their performance." File transfers and electronic mail between systems is done through modems.

Fortune Systems Corp. of Redwood City, Calif., offers several versions of its 32:16 system, which uses a 68000 processor. The five-user PS system lists for $6,995; the 13-user XP system's base price is $9,995; and the new SX with a 12MHz chip, supporting 17 users, lists for $11,995.

Reaching the lower end of the multi-user micro market is, of course, Big Blue with its AT, which debuted last August. Based on an 80286 chip, the AT can use Microsoft's workalike version of Unix, called Xenix, to support three users—one on the console and two through serial ports. (Third parties are offering expansion boards that will enable the machine to support more users.) To run Xenix, which costs $395, the AT needs 512K of RAM, a 20MB hard disk, and a 1.2 MB floppy. It can support three terminals—the console, a second terminal connected through the serial port, and a third through the modem port. AT&T was careful to say that it can support nine users—meaning nine user IDs can be active. (No clones have come to light. But with Unix as a software standard, hardware cloning is superfluous.)

PUSH IS ON FOR 32 BITS

As for the future, there's a general agreement that the push is on toward 32 bits by nearly every vendor: "If the competition is advertising 32 bits, then it becomes one of those boxes you have to be able to check when the bid request form comes out," notes Rich Siegel, senior director of product marketing at Fortune Systems.

But Siegel also believes that going to 32 bits is worth it for its own sake. He points to Fortune's 68020 project, called Belmont, which showed that a move to 32 bits could double the number of effective users (from 12 to 24) a Fortune 32:16 SX could support.

But there's also a consensus that after 32 bits are reached, the market will have to look elsewhere for excitement. "Our planning assumptions are that the market will reach a plateau with 32 bits, and after that, further breakthroughs will come about through parallelism," says Bob Marsh, chairman of Plexus Computers Inc. of San Jose. Plexus sells a range of supermicros, starting at $9,000 for an eight-user 68000 machine with 512K of RAM and a 12MB hard disk running Unix.

"You can go two to three times faster than generic chips using reduced instruction set computers, but that's tuning, not an order-of-magnitude breakthrough," Marsh explains.

Meanwhile, there's the LAN competition to contend with, notes Juge of Radio Shack. "The future depends on how the LAN software shakes out," he says. "There's a limited number of software packages available in the Xenix and Unix environment, but what's there was designed for multi-user work. PC costs are coming down, so the price advantage of multi-user systems over LANs is disappearing. But there are an awful lot of people around who really like Unix and Xenix." Further, new ideas for distribution channels are needed, says Marsh. The var/oem formula may be the easiest answer, but no longer the best. "Everybody seems to be looking for third parties who are experts in a given applications area, who can develop software and oem hardware," Marsh points out. "But such people are usually underfinanced and lack technological sophistication and are the least prepared to build a national distribution network. And there is no channel for exploiting well-defined but limited opportunities, like the man who came to see me with software for dialysis clinics. There are only 200 such clinics."

IBM's presence on the playing field may prove to be the greatest challenge facing supermicro makers. Analyst Bosomworth considers Big Blue's arrival as the beginning of the end for the others. "The opportunity that did exist for small vendors to make high-powered machines has evaporated with the AT," he contends.

James Renalds, an industry analyst with Dataquest, is more optimistic. "It's still a very wide-open market, which is why you see big vendors getting in," he says. That it is wide open is clear from the fact that market leader Burroughs has only a 13% share of the $4.2 billion market.

"But there are big challenges," he adds. "We are already starting to see mergers and rumblings. The AT will give some growth to the market but, in the long term, it will make many vendors decide not to participate."

Nearly every analyst predicts that the market itself will keep on growing, though. Renalds forecasts an annual growth rate of 28% between 1985 and 1987. Future Computing Inc. of Dallas is even more bullish, estimating a 36.2% annual growth rate. Supermicros, says Alan T. Hald, chairman of MicroAge, are "a growth market in the future." Beyond these glowing forecasts, however, only one thing seems clear and that is that the industry will get 32 bits—and more uncertainty. ◉

Lamont Wood is a free-lance writer based in San Antonio.

"I didn't come here to beg."

CARTOON BY STEVE ATTOE

A new survey ranks the largest value-added resellers in the U.S.

THE TOP 10 VARS

by Edith Holmes

The problem is one of definitions. At what point does a systems house become a systems integrator, or a systems integrator a value-added reseller? The lines blurred for us in pulling the top 10 vars from Technical Publishing Co.'s annual survey of systems houses and computer oems.

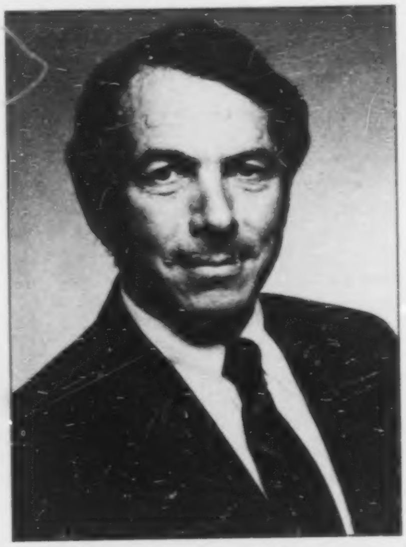
Our definition and the rationale behind DATAMATION's list of leading vars is as follows:

- We omitted computer makers. Thus Sperry, Burroughs, and NCR, all of which appeared at the top of a ranking based solely on the value of computer systems sold, are left out. Also out of the running are smaller firms, such as Monroe Systems for Business in Morris Plains, N.J., and Syntrex Inc. in Eatontown, N.J., both of which design and have a hand in the manufacture of the micros they sell with vertical solutions.
- We also eliminated major computer users such as Rockwell International and large distributors such as Arrow Electronics, since these companies and others like them are not—and are quick to confirm they are not—in the business of buying hardware made by others, packaging it with software and services, and reselling it. Often the large quantities of computers purchased by these firms were for in-house use.
- We included companies whose businesses encompass but go considerably beyond value-added remarketing. And so XL/Datacomp Inc., which packages a variety of services with used IBM equipment for resale to the midrange market, is on the list, as is Istel Inc., which also runs communications networks and offers facilities management services. And we kept on the list those firms that offer many services with the hardware they purchase from others, but no applications software—companies like Federal Computer Corp. and Federal Systems Inc.

With these caveats, then, we offer a list of the top 10 vars (see Fig. 1). Five of the 10 are profiled in depth here. Two of the companies—Istel Inc. and SHL Systemhouse, Inc.—have parent firms outside the United States, specifically in the U.K. and Canada. This ranking also includes a surprising number of vars that have specialized in the manufacturing marketplace. Three of the five organizations profiled here—Ask Computer Systems Inc., XL/Datacomp, and Istel—have set their sights on this field alone.

ASK COMPUTER

For Ask Computer Systems Inc., number one on DATAMATION's list of top vars and among the most mature companies in this industry, the future doesn't lie in new application areas, but in putting its extensive line of software for the manufacturing sector on new machines. Accordingly, after months of discussion, the Los Altos, Calif.-based company decided to adapt its MANMAN Information System for IBM's 4300 minicomputer series. Just under way, the project to design the first release of MANMAN for the IBM line is expected to lead to a product early in 1987.



BRANIFF OF ASK: Capitalizing on market opportunities offered by IBM equipment and factory automation, both here and abroad.

With Ask's software already running on Hewlett-Packard's HP 3000 series and Digital Equipment Corp.'s VAX computers, "we believe we're committed to the right three," says Ronald W. Braniff, president, "and we'll continue to develop our product line for all of these minis."

The stories behind Ask's selection of hardware manufacturers illustrate the var's growth as a company. When Sandra L. Kurtzig, Ask chairman and chief executive officer, first began the firm in 1974, she offered her applications software, designed for manufacturing companies with annual revenues ranging from $5 million to $300 million, on Tymshare Inc.'s network. A timesharing option is available today on the var's own Asknet. But the demand among her customers to run the software on an inhouse machine led Kurtzig to Hewlett-Packard, "a company that was right in our backyard and had an excellent reputation for minis," notes Braniff. "HP proved to be very helpful in the early days."

By contrast, the var's 1981 selection of DEC as its second supplier was based far more on planning than serendipity. "We spent about nine months evaluating companies," recalls Braniff, who joined Ask's board of directors in 1980. "Our decision was based on the substantial marketplace for DEC equipment, on the clear brand preference out there." By the time Ask chose the Maynard, Mass., mini maker, the var had grown up enough to know that any supplier it selected "had to provide growth for us."

Though machines with IBM's logo might have seemed a natural growth opportunity for a company like Ask from the start, they weren't, says Braniff. IBM had no var program until 1984, he points out, and

FIG. 1

THE TOP 10 VARS

COMPANY/ LOCATION/ NATIONAL OR INTERNATIONAL (N/I)	VALUE OF SYSTEMS SOLD (IN $ MILLIONS)	COMPUTERS SOLD/ COMPUTER TYPES
1. Ask Computer Systems Inc. Los Altos, Calif. (I)	45	250/HP & DEC minis; IBM minis by 1987
2. XL/Datacomp Inc. Hinsdale, Ill. (N)	36	175/IBM minis
3. Informatics General Corp. Woodland Hills, Calif. (I)	29.7	N/A/Wang minis & IBM micros
4. Istel Inc. Burlington, Mass. (I)	25	350/DEC, IBM, & Prime minis; IBM & Cromemco micros
5. Johnson Controls Inc. Carrollton, Texas (I)	25	200/DEC & Modcomp minis, DEC & IBM micros
6. Systems Associates Inc. Charlotte, N.C. (N)	17.08	82/DEC & Point 4 Data minis
7. Federal Systems Inc. St. Louis, Mo. (I)	17.045	636/DEC & IBM minis, Eagle & IBM micros
8. International Research Eval-Design Concepts Eagan, Minn. (I)	15	39/DG, DEC, HP, & IBM minis; Altos, DEC, TeleVideo, & Wang micros
9. SHL Systemhouse Inc. Arlington, Va. Chicago, Ill. San Mateo, Calif. (I)	15	100/DEC, HP, Wang, & AT&T minis
10. Loonam Computer Products Minneapolis, Minn. (N)	13	5,500/DEC, North Star, TI, & Altos micros

Source: Technical Publishing Co.'s *Survey of Systems Houses and Computer OEMs*

Ask's strategy depends on the provision of a complete hardware/software package to its customers. In addition, Armonk only began to move clearly to the price/performance of the mini market with its 4361. "The 4300 series is a mainstream product line for IBM and so offers tremendous growth opportunities for our company," Ask's president explains. "We believe that the tens of thousands of factories out there that have yet to buy our product or anyone else's will be attracted to MANMAN because it runs on IBM hardware."

In addition to their decision to rewrite MANMAN for IBM computers, Ask managers expect the company to grow beyond its 1984 net revenue of $65 million and its 850 installed systems by broadening its software product line. The firm announced seven new packages this spring. "There is an unending list of potential manufacturing applications—in fact, more than we can do in the next two to three years," says Braniff.

Growth is also expected to come from markets outside the United States. For the past five years, Scicon, a wholly owned subsidiary of British Petroleum, has served as a distributor for Ask products in the United Kingdom. Ask also has a sales office in Canada and one in Australia and supports more than a dozen U.S.-based companies with factories in the Far East. The var will build on this start abroad through a letter of intent recently signed by Ask and Hewlett-Packard whereby HP will become the reseller's sales agent in several countries around the world. Four Western European countries will be targeted first—West Germany, France, Italy, and the Netherlands. Ask is reviewing the possibility of providing direct support to its Far East customers through a sales office by 1986.

OWENS OF XL/DATACOMP: Focusing on manufacturing and the midrange market.

Back home, the company's current business plan calls for research and development "to position MANMAN to easily connect with other islands of automation in the factory," says Braniff. The R&D program is expected to yield products that will begin to link Ask's information system to computer aided design/computer aided manufacturing (CAD/CAM) and materials handling systems by the end of the year. "We're still learning here," the Ask executive adds. "We don't have it all figured out. We want an interface that is hardware independent."

XL/DATACOMP

XL/Datacomp Inc., a Chicago area-based reseller of midrange IBM equipment, went public in March, its 1.34 million shares trading for $15 apiece. After five years of operation and "lots of elbow grease," says president and chief executive officer Thomas M. Owens, the firm became one of the few companies in value-added remarketing to take on the stock market.

The firm is in a good position to do so. Datacomp is selling IBM's System/34, 36, and 38—computers that range in price from $30,000 to $300,000—to a market with an installed base of more than 130,000 sites and expanding at a compounded growth rate of 25% a year. Last year, IBM made this market even more attractive to independent sales and service organizations like Datacomp by adding distribution channels for its new midrange gear that extend beyond its direct marketing force.

Armonk launched a Value Added Remarketer program through which it discounts its System/36 to independent companies that repackage the equipment for resale with software and other services. At the same time, Big Blue reduced installation and support services for many of its new products, including the System/36. Because the company cannot afford to support it, notes Owens, "the midrange market is almost adrift from IBM."

Today, Datacomp—once restricted to purchasing used systems from the secondary market for resale with additional services like on-site maintenance, leasing, installation planning and assistance, and equipment trade-in—can now sell new machines as well. The firm became an IBM var last October through a subsidiary, XL/Systems Support Inc., which sells new System/36s. The var program accounted for 5% of the company's sales of $14.5 million in the first quarter of FY '85 that ended December 31. Growth is expected to continue.

Datacomp's Systems Support unit

This ranking includes a surprising number of vars specializing in the manufacturing marketplace.

repackages System/36s with applications software for manufacturers. "We thought this was the area that provided the greatest potential across the midrange marketplace," says Owens. Users have a particular need for such software, he contends, because the package IBM offers in this field is so difficult to use. Datacomp is evaluating other applications to target in the future.

As far as becoming a var for hardware made by another manufacturer, Datacomp has no immediate plans. If the firm went this route, "we'd probably choose DEC," comments Owens. "But we're so busy in terms of the volume and the kind of growth we're experiencing that we're not thinking that way right now." With revenue growth of 61% annually since 1980, Datacomp's whole orientation is toward Big Blue. Owens came to the company in 1979 after 20 years in marketing positions with IBM, and most of the members on the firm's management team have at least 15 years of selling for the computer giant on their résumés.

Datacomp has opened seven sales offices around the country and three warehouses, in Chicago, northern New Jersey, and Los Angeles. Its employees number 150. The firm plans to be in 12 cities by the end of 1985 and in 27 metropolitan areas two years from now. Its management will use some of the $10.8 million raised by the public offering—handled by Smith Barney, Harris Upham & Co. Inc. of New York—to increase inventories on attractive terms and to reduce the firms's already low debt. Owens suggests the firm will also be on the lookout for other vars to buy.

Indeed, he fully expects to see "a lot of consolidation among vars, because manufacturers will not be interested in dealing with several small resellers. Manufacturers are interested in reducing their administrative burden," the reason that var programs proved attractive to hardware makers in the first place. If that burden grows as the manufacturer takes on more vars, the remarketers can expect a shakeout.

INFORMATICS GENERAL CORP.

Over the past four years, Informatics General Corp. has either entered or expanded its presence in four vertical markets by acquiring five small vars that specialized in those fields. These markets—public accounting, law, construction, and retailing—have become a part of the company's Informatics Applications organization, a major unit that last year saw its revenues grow 60% to nearly $88.3 million and its operating profit soar 85% to just under $9.7 million.

Overall, the company's 1984 revenues edged over $191 million and its income approached $6.3 million. The firm's other major organization—Information Systems, which offers professional services and software products like micro-to-mainframe links—grew only 4%, with revenues rising to a little more than $101 million while operating profits declined substantially from almost $9.45 million to $4.74 million.

PAPARELLI OF INFORMATICS: Building top-flight marketing and distribution channels.

Despite Informatics Application's healthy growth last year, there will be no more acquisitions in 1985, says Charles J. Paparelli, group vice president of Business Management Systems, the part of the firm's var organization that has absorbed most of these acquisitions. Instead, the company will consolidate its current holdings and concentrate on building top-flight marketing and distribution channels—particularly for low-end, or micro-based, systems that range in price from $12,000 to $25,000 with hardware.

"Ideally, when you acquire a company, you get a strong marketing and distribution system along with an excellent product, good support, and first-rate technical people," observes Paparelli. "But in reality, a firm that is good at marketing and distribution is hard to find." Informatics' strategy has been to buy firms that it believes have top products and people in these vertical markets, and then to spend time creating a sales organization for them.

For the past two and a half years, the company has been working on its independent sales network, signing select dealers in the United States and Canada to sell its IBM PC-based products. Paparelli says the requirements are strict and the financial commitments tough. The chosen must take an intensive course in selling Informatics' products, and the company prefers that the dealers who apply have sales experience in the relevant vertical market. Just how many dealers it has now, the firm won't reveal.

Informatics reserves for its direct sales force those applications built around machines more complex than the single-user personal computer. "Many dealers simply aren't prepared for this market yet," comments Paparelli. "The low-end market, with its price barriers and larger audience, is more forgiving." The Informatics executive, however, fully expects that as vertical markets mature and dealers come to understand them, independent sales organizations will be able "to move up through the vertical to more sophisticated equipment."

Paparelli believes that the maturity of a vertical market is a key factor in the ability of a dealer, or his own direct sales force, to penetrate it. With some 6,000 systems installed, the Informatics Accounting Pro Series for CPAs is "the most mature market we've got. We don't have a user base this size in any of our other markets."

The group vp contrasts the computer savvy of accountants with that of construction contractors and property managers. "We're fighting the battle of maturity in these verticals," he says. "They've accepted computers, but remain on the bottom half of that acceptance curve, compared with CPAs. The CPA knows he needs automation and what he needs it for. But we have to tell the construction contractor why he needs our system and how he might use it." Adds Paparelli, "That makes for a longer and more expensive sales cycle." As a result, the products Informatics and others sell to these markets tend to be more expensive than the vertical solutions for more mature markets.

For Paparelli, the greatest challenge in the var business "is building an organization at the same speed at which the market is maturing." He suggests that too many resellers tend to throw money at the problem of an underdeveloped vertical, assuming that the answer is marketing when it may simply be "sitting back and waiting for the explosion to happen."

ISTEL INC.

Like Ask Computer Systems and XL/Datacomp, Istel Inc. of Burlington, Mass., has concentrated its value-added reselling efforts on the factory. Indeed, the principal strategy of this privately held company—whose stock is owned by automotive giant

Growth is also expected to come from markets outside the United States.

British Leyland, which, in turn, is an asset of the British government—is "to extend ourselves more adventuresomely in the manufacturing market," says Seymour A. Rosen, president of the firm.

But the course that Istel has mapped out for itself has an interesting twist: the company is just as committed to data communications as it is to manufacturing, and thus marries the application and the utility in the var solutions it offers clients like General Motors and NCR—something Ask, for example, is just beginning to do. "Communications has to be a major area for growth in the years ahead," adds Rosen. "It just has to be."

Istel is well positioned in both fields. The U.K.-headquartered company's main software packages, a system for discrete event simulation called See-Why, won the British Computer Society's Applications Award in 1981 for the best new application of the year and is installed in several major U.S. manufacturing companies. This program and the other software packages that Istel sells are oriented more toward manufacturing analysis than operations.

In Britain, Istel is a U.K. Department of Trade and Industry approved consultant in computer aided design and computer aided manufacturing and the application of micros on the factory floor. Drawing first on its experience in helping British Leyland companies modernize and improve productivity through automation, the firm has been selling its approach to the manufacturing vertical market in the U.S. for the past four years.

Back across the Atlantic, meanwhile, Istel has a hefty reputation as a communications company. Its private communications network covers the U.K. It has developed both an electronic mail service, dubbed Comet, and built a nationwide videotex service named Viewshare. Istel also provides communications services for value-added networks in Britain and has installed broadband local area networks for manufacturers for some time now.

Istel has 1,200 employees worldwide and, while a good deal of its business is in the United Kingdom, the United States is its next biggest source of revenue. Because it is a private firm, the company won't say what those sales were for 1984, but, according to Rosen, its var business—both turnkey and custom—makes up just under half of its volume. Since the British government is gradually selling off assets like British Leyland, Istel expects to be sold at some point in the future.

The company isn't wedded to a single hardware manufacturer. Instead, it offers its manufacturing software on the full range of computers made by IBM, as well as minis from Prime Computer and Digital Equipment and micros from Cromemco. For Rosen, an IBMer for 15 years, a major pitfall in remarketing is being tied too closely to one computer maker or one machine. "If, one day, the system is no longer in vogue, you're in trouble," he says. "The key to avoiding this problem is to make your applications software as portable as possible," and to do so from the very beginning.

FEDERAL SYSTEMS INC., FEDERAL COMPUTER CORP.

For 10 years, Robert A. Hummel and Gary W. Leiendecker talked about going into business for themselves. They had first met and worked together in the early '70s at Singer Business Machines before that firm decided to leave the computer field, and then remained friends as Leiendecker went to work designing computer systems for steel mills and Hummel sold dp gear to the federal government. As the steel business hit the skids and Hummel tired of working for others, the two men discussed the possibility of forming a company of their own.

Toward the end of the 1981-82 recession, they took the plunge, opening their doors for business as sister companies located in St. Louis, Mo., and Fairfax, Va., that would focus on selling "integrated equipment solutions" to the U.S. government. Today, Leiendecker, president of Federal Systems Inc., and Hummel, president of Federal Computer Corp., believe their initial growing pains are over. In 1983, the combined companies sold the feds some 636 computer systems worth more than $17 million. Their 1984 sales amounted to some $30 million and they employ approximately 25 people in the two locations.

Hummel and Leiendecker were attracted to the government marketplace primarily because of its size. "The government is still the biggest dp user in the country," says Leiendecker, and with a total of 40 years of dp experience on several types of computers, the two thought they could meet the needs of a big user with a multitude of requirements.

To be competitive in this marketplace, Federal Systems and Federal Computer do not specialize in any one manufacturer's hardware. Instead, "we attempt to decipher an agency's needs and to come up with the best solution to handle a particular problem," explains Leiendecker. Adds Hummel, "There are some pieces of hardware that, through experience, we know better than others, so we tend to gravitate toward them. But we don't rule anything out." The two firms frequently propose systems built around DEC and IBM minis and IBM and Eagle micros, as well as peripherals from Telex, Control Data, and Memorex.

The packages they put together for federal agencies include the hardware, operating system software, and maintenance—either subcontracted out to the manufacturer or a third party—but no applications packages. The requirements of their first client three years ago typify the tasks the two companies tend to take on: an Army unit on the East Coast needed peripherals for a system it already had inhouse, and they supplied the agency with printers, card readers, and card punches. The largest federal job Hummel and Leiendecker have won was worth approximately $25 million, although they have bid on contracts valued at $250 million.

As they look toward the future, Federal Computer and Federal Systems hope to increase the size of the government contracts they win. Hummel and Leiendecker believe they have established a solid track record with agencies, pointing proudly to the fact that "we have never defaulted on a contract." They also expect the business to grow because of the place they have held for the last year on the General Services Administration's computer schedule, a kind of shopping list of preapproved vendors that agencies can turn to for equipment.

But now, comfortable selling solutions to this marketplace, the two dp professionals say they are ready to branch out into commercial sales. Federal Computer has opened a retail store in Virginia that specializes in micros. It is geared to corporate clients with a particular requirement for local area networks, and Federal Systems expects to follow suit in Missouri sometime next year.

The biggest problem in this business is an ongoing one: selecting the right alliances with manufacturers. "The key is to have the products that the end users want. If your alliances with companies are poorly chosen, it's difficult to satisfy those customers," he says. Good relationships with manufacturers, Hummel adds, are usually dependent on no more than good business practices—with one exception. "The main product that everyone has to deal with is the IBM PC, and there is no way to control a giant like IBM." Having enough IBM micros in stock and ready for customer sites is a constant source of concern. Notes Hummel, "Like everyone else dealing with IBM in the business, some days there's a feast, and some days, a famine." ■

An international survey sheds new light on the personalities of data processors.

THE DP PSYCHE

by Michael L. Lyons

The term "programmer personality" has become cliché. Even so, all the managers and technical professionals that we at NT Systems Corp. have talked to over the years acknowledge that computer folk are, in some undefined way, different from other folk. This article will examine some of the whys and wherefores of this common perception.

For the past three years, we've been conducting a survey of the personalities and work preferences of computer professionals employed by over 100 different companies. Although a large number of computer professionals have already participated in the survey, data are still being collected to study specific jobs and industries.

We are not trying to define or classify any typical personality. One might just as well try to describe a typical company.

At this time a total of 1,229 individuals have participated in the survey, 213 of whom work overseas in Australia and Great Britain. Almost all work for large to very large firms, including insurance companies, financial institutions, utilities, and hardware manufacturers.

There are more than twice as many men (73%) as women (27%) in the survey population. This difference is probably representative of the computer industry as a whole, which has historically attracted more men than women.

As shown in Fig. 1, about half of the people are in their thirties, with the women slightly younger than the men. The median age for the women is 31, while the men's median age is 34.

The survey participants are a well-educated group; of those supplying education information, about one half have a four-year-college degree and one fifth hold graduate degrees. A higher percentage of women have college degrees, but more men hold advanced degrees.

Fig. 1 also shows that about 30% of the population has been working in computing for five years or less, and over a third have more than 10 years of computing experience. The median is seven years for women and 10 years for men.

20% WORK AS MANAGERS

Finally, a breakdown of the jobs held by the survey participants is given in Fig. 1. Almost 20% of the people surveyed are in management positions—some as directors and a few as vice presidents. Project managers, supervisors, and team/project leaders accounted for about another 20%. A higher percentage of men than women hold management positions. This difference may be due to the fact that the men in the survey population are somewhat older, with more years of computing experience.

The Myers-Briggs Type Indicator (MBTI) was used to assess the psychological types of the individuals participating in the survey. It is based on Carl Jung's theory of psychological type, which describes how people's behaviors are not random, but differ in certain consistent, fundamental ways.

The MBTI has been well researched and widely accepted over the past 20 years. We have been using it with considerable success in our dp consulting and training courses for the past five years.

The Myers-Briggs model of personality type is inherently nonevaluative and easy to learn. As with most programming languages, though, appreciation of its capabilities and usefulness increases with knowledge and experience. Recent articles appearing in DATAMATION (e.g., "In Search of the Perfect Programmer," March 15, p. 128) have introduced readers to the MBTI model and presented some findings on small groups of programmers.

Just as people tend to favor or prefer either their right or left hands, they also tend to make other choices very early in life that help to explain their behavior and attitudes. Through repeated use and reliance, these choices are strengthened into the four personality preferences that determine one's psychological type.

Each of the factors is described as one of the following eight personality preferences:

- extraversion or introversion
- sensing or intuitive
- thinking or feeling
- judging or perceiving

Of course, people can and do use all eight preferences. In each of the four pairs, however, we all have one preference that is stronger than the other, one that works better for us than its complement.

The combination and interaction of an individual's four personality preferences produces one of 16 psychological types. While an individual's personality includes far more than his or her type, the use of type can provide a very effective tool for understanding and improving interpersonal communications. The Myers-Briggs model provides a means for understanding and appreciating ourselves, others, and how we differ.

Before we can take a look at some of the different psychological types, we must describe each of the eight personality preferences.

The choice between extraversion (E) and introversion (I) reflects one's basic orientation, either outward or inward. Someone with a preference for E tends to live more in the outer world of people, things, and action. The introvert is more comfortable in the inner world of ideas.

The E usually receives energy when interacting with the "outside world," while the I is exhausted by the outside world but is energized through solitary activities. An E is usually very comfortable with new groups of people, while an I prefers to deal with people one-to-one or in small, known groups.

As can be seen in Fig. 2, fully two thirds of the survey participants were found to be introverts. In the general population one would expect to find the reverse—more than two thirds preferring extraversion. Part of this difference may be due to the fact that more Is than Es pursue advanced education, and the survey population is very well educated.

The E-I difference may also be due in part to how computing careers are perceived. Not many extraverts would relish the thought of performing solitary programming activities, day after day. Yet it is precisely this sort of activity that appeals to many Is. This issue is fast becoming moot as the diversity of jobs available in computing increases, and more students study dp not for its special appeal but for monetary reasons.

It is interesting to note that the managers and supervisors in the group had almost the exact same two-thirds bias for Introversion. This may be due to a general tendency in computing to promote some of the best technical people (very often Is) into management. The additional extraversion required by managerial positions makes this transaction more difficult for the I than for the E.

FIG. 1

DESCRIPTION OF SURVEY POPULATION

AGE DISTRIBUTION

	MALE		FEMALE		ALL	
	N	%	N	%	N	%
< 25	39	4.3	31	9.5	70	5.7
25-29	195	21.6	104	31.9	299	24.3
30-34	268	29.7	87	26.7	355	28.9
35-39	220	24.4	74	22.7	294	23.9
40-45	110	12.2	20	6.1	130	10.6
> 45	71	7.9	10	3.1	81	6.6
Totals	903	100%	326	100%	1229	100%

EDUCATIONAL LEVEL

	MALE		FEMALE		ALL	
	N	%	N	%	N	%
No college	96	10.6	20	6.1	116	9.4
Some college	172	19.0	54	16.6	226	18.4
4 year degree	387	42.9	181	55.5	568	46.2
Masters	179	19.8	55	16.9	234	19.0
Doctorate	28	3.1	4	1.2	32	2.6
Not given	41	4.5	12	3.7	53	4.3
Totals	903	100%	326	100%	1229	100%

YEARS IN COMPUTING

	MALE		FEMALE		ALL	
	N	%	N	%	N	%
<3	54	6.0	41	12.6	95	7.7
3-5	170	18.8	102	31.3	272	22.1
6-10	294	32.6	96	29.5	390	31.8
11-15	223	24.7	61	18.7	284	23.1
>15	143	15.8	23	7.1	166	13.5
Not given	19	2.1	3	.9	22	1.8
Totals	903	100%	326	100%	1229	100%

TYPE OF JOB

	MALE		FEMALE		ALL	
	N	%	N	%	N	%
Programmer	76	8.6	61	18.7	137	11.1
Programmer/Analyst	92	10.2	47	14.4	139	11.3
Analyst	103	11.4	41	12.6	144	11.7
Systems Programmer	49	5.4	14	4.3	63	5.1
Engineer	127	14.1	21	6.4	148	12.0
Team/Project Leader	68	7.5	13	4.0	81	6.6
Supervisor	54	6.0	34	10.4	88	7.2
Project Manager	45	5.0	14	4.3	59	4.8
Management	187	20.7	51	15.6	238	19.4
Other	102	11.3	30	9.2	132	10.7
Totals	903	100%	326	100%	1229	100%

RELYING ON THE SENSES

The choice between sensing (S) and intuitive (N) determines how one prefers to take in data, to perceive. The person with a preference for sensing tends to rely on his senses, what is real now, and what has been experienced. The intuitive person prefers to look for meaning and possibilities, beyond the information supplied by the senses.

Sensing types tend to be practical, realistic, and observant. Intuitives put more emphasis on imagination, creative problem solving, and new projects. One can generalize that an S will often prefer to perform a task in a particular fashion because he has done so before and it has worked. The N will prefer to perform the task some other way, for the very same reason! Since there are few organizations that allow such freedom, Ns are more often bored with their work.

Fig. 2 shows that the survey population was divided almost evenly between sensing and intuitive. In the general population one would expect to find 70% to 75% of the people with an S preference. The educational level of the group may account for some of this difference, as more Ns than Ss pursue higher education.

Quite a bit of sensing behavior is required of the managers and supervisors who must define and enforce procedures, and who often determine and monitor schedules. But there was no appreciable difference between the managers and supervisors and the rest of the survey popula-

An international survey sheds new light on the personalities of data processors.

tion with respect to sensing and intuition.

In different kinds of organizations, the S-N distribution may vary considerably, depending on two factors: 1) Does the kind of work being done appeal more to an N or an S?; and 2) Is the organization selecting for Ns or Ss in its hiring practices? In particular, we've observed that R&D organizations and firms that do a lot of state-of-the-art development attract and hire more Ns than Ss. The opposite occurs in large organizations where the bulk of the work involves maintaining and enhancing production systems.

A great many of the communication difficulties experienced on the job are based on an S vs. N difference. The customer or user with a strong S preference isn't interested in what might be done, but rather in what will be done and when. The systems designer with a strong N preference may have difficulty ending the design process and moving on to implementation.

In the next set of preferences, thinking and feeling, the choice is between two rational judging processes. People who make decisions on a logical and impersonal basis demonstrate a thinking (T) preference. Those who make decisions in a more subjective fashion, based on personal values, have a preference for feeling (F).

An F preference must be carefully distinguished from the term "feelings" as commonly used. It is quite distinct from emotions and similar feelings. Feeling is an especially appropriate judging process when dealing with people, as the personal values involved on both sides are always included in the process. Ts are at their best when their decisions require impersonal analysis, logic, and consistency.

Over 80% of the survey population had a thinking preference, as shown in Fig. 2. This is an exceptionally strong ratio of thinking to feeling. In the general population, about 60% of women have an F preference and about 60% of men have a T preference. The bias toward the T preference was strong for both the women and the men, with about 70% and 85% respectively. Approximately 83% of the managers and supervisors preferred thinking to feeling.

It has been our experience that some computer professionals with an F preference have done so well at developing their T function that they can function as Ts at work and may be reported as Ts on the MBTI. They are able to set aside their feeling preference and exert effort to meet the demands of technical work and the expectations of their associates (Ts).

While most jobs in computing require a well-developed T process to deal with the immutable demands of hardware and software, such is not the case in most management positions. In supervisory and management positions, where the emphasis should be on people issues more than technical issues, a well-developed F process may prove very useful. The very successful programmer, analyst, or engineer with a strong T preference (and probably also an I preference) faces a particularly difficult transition when promoted into management.

Those with a judging (J) preference tend to live in a planned, orderly fashion and like to exercise control over their lives. They like to have things completed and issues resolved. Decisions can be made by those with a J preference whenever they believe they have the required essential information.

Those with a perceiving (P) preference tend to live in a more flexible, reactive manner, wishing to understand and adapt to life. They like to remain flexible and keep their options open. Those with a strong P preference may never have sufficient information to be truly comfortable making important decisions.

WOMEN PREFER J TO P

In Fig. 2 we see that approximately two thirds of the survey population had a judging preference. This compares with a roughly equal distribution in the general population. Slightly more women than men preferred J to P.

It's quite possible that computing holds a special attraction for people who prefer a linear, systematic approach to problems—Js. Also, some Ps are undoubtedly being eliminated from consideration for entry-level positions due to a lack of specific educational prerequisites. School/college systems, rules, and procedures are more of an obstacle for Ps than for Js, and they are more likely to drop out of formal education programs.

You'd expect managers in any industry to demonstrate a high bias toward J, since the responsibilities of the job usually require a good deal of J behavior. Decisiveness, working from a plan, and organization are among the J traits expected of managers. But there was no difference in the J-P distribution between the managers and supervisors and the rest of the survey population.

Those with a strong P preference may run into difficulties in large organizations. They are required to adapt to procedures and systems for which they personally have little interest or use. Ps tend to take deadlines less seriously than Js, and often rely on a great "last minute" effort to get the work done.

A difference in J-P attitude is second only to an S-N difference in causing communication problems between people with different preferences. J-P would probably rank first, except that most Ps have learned at school and at work to adapt to predominately J organizations.

Fig. 3 reveals the distribution of the four combinations of perception and judgment: sensing-thinking (ST), sensing-feeling (SF), intuitive-feeling (NF), and intuitive-thinking (NT).

Approximately 39% of the survey population are STs. People with a sensing-thinking combined preference are usually concerned with facts. They tend to be practical, down-to-earth individuals. Many technical areas in data processing are of interest and well suited to the ST.

The data processor is often characterized as having the attributes of an ST (and of a J as well). STs usually like working in large organizations that provide a clear hierarchy, job descriptions, promotional opportunities, and job security. They are

FIG. 2
PERSONALITY PREFERENCES

	MALE		FEMALE		ALL	
	N	%	N	%	N	%
Extraversion (E)	272	30.1	132	40.5	404	32.9
Introversion (I)	631	69.9	194	59.5	825	67.1
Sensing (S)	413	45.7	156	47.9	569	46.3
Intuitive (N)	490	54.3	170	52.1	660	53.7
Thinking (T)	771	85.4	223	68.4	994	80.9
Feeling (F)	132	14.6	103	31.6	235	19.1
Judging (J)	572	63.3	236	72.4	808	65.7
Perceiving (P)	331	36.7	90	27.6	421	34.3

Judging personalities live in a planned, orderly fashion; perceivers prefer a more flexible, reactive manner.

far less likely to join a startup company.

Accounting for only about 7% of the survey population, sensing-feeling types are clearly in the minority. This is not surprising as the field of computing/data processing offers little of interest to SFs. Their primary orientation is to help others by performing tasks that provide direct, tangible benefits. SFs tend to be friendly and sympathetic individuals.

While SFs may be drawn to business and applied science, they are usually more interested in the health, sales, or teaching fields. The majority of SFs one finds in computing will have preferences for introversion and judging. Other SFs may find specific jobs or niches within a dp organization that suit their preferences. The SFs that can't find such a job may decide computing was an unsatisfactory career choice and leave it.

Somewhat better represented in the survey population are the NFs, comprising 12% of the total. Those with an intuitive-feeling orientation are concerned primarily with understanding and communicating with others. They are always on the lookout for new possibilities for themselves and others. NFs tend to exhibit considerable insight and enthusiasm.

Many NFs are drawn to fields like psychology, teaching, and writing; the technical aspects of computing hold little long-term attraction. One would expect that many find their niche in the less technical, more people-oriented positions in the business. For example, an NF would tend to be much happier as a systems analyst with direct user contact than he would be developing microcode for a new processor.

FIG. 3

COMBINATIONS OF PERCEIVING & JUDGING PREFERENCES

MALES		FEMALES		ALL	
ST	SF	ST	SF	ST	SF
40.8%	5.0%	35.0%	12.9%	39.2%	7.1%
44.6%	9.6%	33.4%	18.7%	41.7%	12.0%
NT	NF	NT	NF	NT	NF

FIG. 4

TYPE CHART OF COMPLETE SURVEY POPULATION

	ALL – N = 1229		MALE – N = 903		FEMALE – N = 326	
	N	%	N	%	N	%
ISTJ	278	22.6	222	24.6	56	17.2
ISFJ	48	3.9	22	2.4	26	8.0
INFJ	33	2.7	18	2.0	15	4.6
INTJ	191	15.5	146	16.2	45	13.8
ISTP	64	5.2	47	5.2	17	5.2
ISFP	18	1.5	11	1.2	7	2.1
INFP	44	3.6	36	4.0	8	2.5
INTP	149	12.1	129	14.3	20	6.1
ESTP	26	2.1	22	2.4	4	1.2
ESFP	9	.7	6	.7	3	.9
ENFP	42	3.4	24	2.7	18	5.5
ENTP	69	5.6	56	6.2	13	4.0
ESTJ	114	9.3	77	8.5	37	11.3
ESFJ	12	1.0	6	.7	6	1.8
ENFJ	29	2.4	9	1.0	20	6.1
ENTJ	103	8.4	72	8.0	31	9.5

WORKING CLIMATE IMPORTANT

The climate of the work group is of great importance to both NFs and SFs. In fact, it is often more important than the work itself. Therefore, they try to help their associates achieve and maintain good working relationships. This important team-building function is neglected in working groups of Ts.

About 42% of the survey population had an intuitive-thinking combined preference. Slightly more men are NTs than are STs, while the reverse is true for the women surveyed.

The NT individual is usually most interested in technical developments and relevant theories and models. Like NFs, the NTs look for new possibilities, but NTs tend to overlook the human elements in favor of the technical.

NTs are heavily represented in R&D organizations. In most dp organizations NTs will be attracted to areas engaged in major systems development activities. Once all the conceptual work on a project has been done, however, many NTs prefer to start working on something new. They will usually try to avoid work that is similar to what they have already done. NTs always seem to be looking for new challenges.

Fig. 4 shows the entire survey population. One's personality type is defined by the four letters, representing one's four personality preferences: extraversion (E) or introversion (I), sensing (S) or intuitive (N), thinking (T) or feeling (F), judging (J) or perceiving (P).

The personality type with the highest occurrence, almost 23%, is ISTJ—the combination of introversion, sensing, thinking, and judging. ISTJs assume responsibility readily and tend to be very dependable and persevering. They usually maintain a conservative outlook and avoid taking any unnecessary risks.

An ISTJ is likely to feel very much at home in a large conservative organization with well-defined policies and procedures. They will gravitate toward secure positions and try to avoid areas like sales, user liaison, and training.

The next two most frequently occurring types in the population are the two introversion-intuitive-thinking types, the INTJ and the INTP. The INTJ is the more likely of the pair to follow a project through to implementation and thus achieve the closure that Js seek. INTPs will often prefer to leave the implementation of their grand designs to others, if they believe their work will be carried on properly. Both INTs have a low tolerance for error in their own work or for what they see as incompetence in the work of others.

As a result of the J preference, the

Ronald Reagan
President Ronald Reagan

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INTJ tends to be more organized and to do more planning than the INTP, who would usually prefer to be working on a current problem or learning something that might help solve a future problem. In computing, the INTP is often very happy pursuing a technical career path, if one is available, while the INTJ is more likely to actively seek a management position.

These three personality types—ISTJ, INTJ, and INTP—account for just over 50% of the survey population. Examination of additional survey data will be required to study different industry groups, specific jobs, and areas of expertise and specialization.

Many organizations have a very strong bias toward certain personality preferences or even specific psychological types. This is partially due to the nature of the work being performed, but may also be caused by managers who hire "in their own image." People sharing the same psychological type usually communicate and get along well when they first meet each other. Most managers think well of themselves; and, after all, they have been successful in their careers.

These days there are very few solo performers in most computing organizations. People have to work together in teams of some sort, and it is almost always good to have some diversity on the team in terms of psychological type. It would be great if there were a simple rule that one could follow—such as, "put an F on every team"—that would assure success, but such is not the case.

Each team must be considered individually. Differences in psychological type may produce some initial friction within the team, but a better functioning team will result if those initial difficulties are dealt with and resolved early. An understanding of psychological type can be extremely effective in helping with team or other interpersonal conflicts.

Don't be concerned about guessing people's types accurately, just try to be aware of how their personality preferences may differ from your own. We have found that simply being aware that a person may be of a different type and taking that potential difference into account can greatly improve communication.

After all, it's often not a question of right or wrong, but of how one looks at things. ●

Michael L. Lyons is president of NT Systems Corp. and has 20 years of experience in consulting, managerial, and technical positions. He is currently conducting a major research project on the personality and work preferences of computing professionals in the U.S., U.K., and Australia. Readers interested in participating in Mr. Lyons's survey may contact him at NT Systems Corp., 20942 Seacoast Circle, Huntington Beach, CA 92648, (714) 960-6770.

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DATAMATION

85

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DATAMATION

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FEATURES

22
IN FOCUS
Once the backwater of the computer industry, value-added reselling is coming on like a tsunami after an earthquake. The DATAMATION staff reports on "The Rise of the Vars."

68
OF COMMERCE AND ACADEME
Curt Hartog
Nowhere are marketplace pressures fiercer than in technical areas like computer science; nowhere are universities more conscious of industry needs for their principal "product": bright, well-educated, energetic graduates. Can the needs be met—and should they be?

82
WHO'S TEACHING TELECOM?
David Stamps
The breadth and depth of the telecom discipline, and the time it takes people to master it, are hampering industry recruitment. While many remain hopeful that academic telecom programs will flower, there is also growing frustration.

92
TOWARD A VIABLE OS FOR THE PC
Martin Healey
Like vacuum tubes and analog signals, PC/DOS is outliving its usefulness. Can IBM deliver what corporations need next, or will that be left to independent vendors?

105
SURVEYING THE SOFTWARE GENERATOR MARKET
A. Milton Jenkins
A recent survey helps define the application generator and code generator market.

125
DATA FLOW DYNAMICS
Frank Sweet
The wonderful world of database design is further explored in part two of a 14-part series.

NEWS IN PERSPECTIVE

34 **THE ECONOMY**
Can 1986 be even worse?

36 **TECHNOLOGY**
DARPA and DOD go parallel.
Optical storage arrives.

44 **SOFTWARE**
Close to the edge.
Making micros experts.

58 **FACTORY AUTOMATION**
Gearing for battle.

64 **BENCHMARKS**

DEPARTMENTS

9 **LOOK AHEAD**
15 **LETTERS**
19 **EDITORIAL**

129 **PEOPLE**
135 **HARDWARE**
141 **SOFTWARE**
147 **SOURCE DATA**
152 **MARKETPLACE**
159 **READERS' FORUM**
164 **ADVERTISERS' INDEX**

INTERNATIONAL 64-1

-4 **JAPAN'S TOP 10**

COVER ILLUSTRATION BY BOB WEBER

DATAMATION spots the best and the brightest in the Land of the Rising Sun.

JAPAN'S TOP 10

by Thomas Murtha and Linda Runyan

The leading lights in the Japanese data processing world burned even brighter last year, thanks to dazzling sales on both the home and foreign fronts. In the domestic dp domain, Japan's top 10 stars pulled in combined revenues of $12.5 billion, up 20%. Exports, which eclipsed 1983 levels, chipped in another $3.1 billion to that total.

Statistics from Japan's Ministry of Finance show that the country's computer exports soared a spectacular 60%, while imports grew by roughly 36% in 1984. While these glowing global gains brightened the profit picture of local vendors, they cast a pall over Japan's relations with other nations that faced dimmer dp trade prospects.

Last year exports for the top 10 companies in Japan rose a remarkable 43%. Approximately 20% ($3.18 billion) of their total dp revenues stemmed from export sales, compared to 18% in 1983. The yen's relative weakness against the dollar helped the Japanese boost their export business, which was particularly strong in peripherals and components.

Although the official OECD exchange rates used by DATAMATION indicate a stable yen-to-dollar conversion for 1983 and 1984, the use of an annual average obscures some important trends. In fact, the yen actually weakened against the dollar during the second half of the year, which spurred export sales during that period.

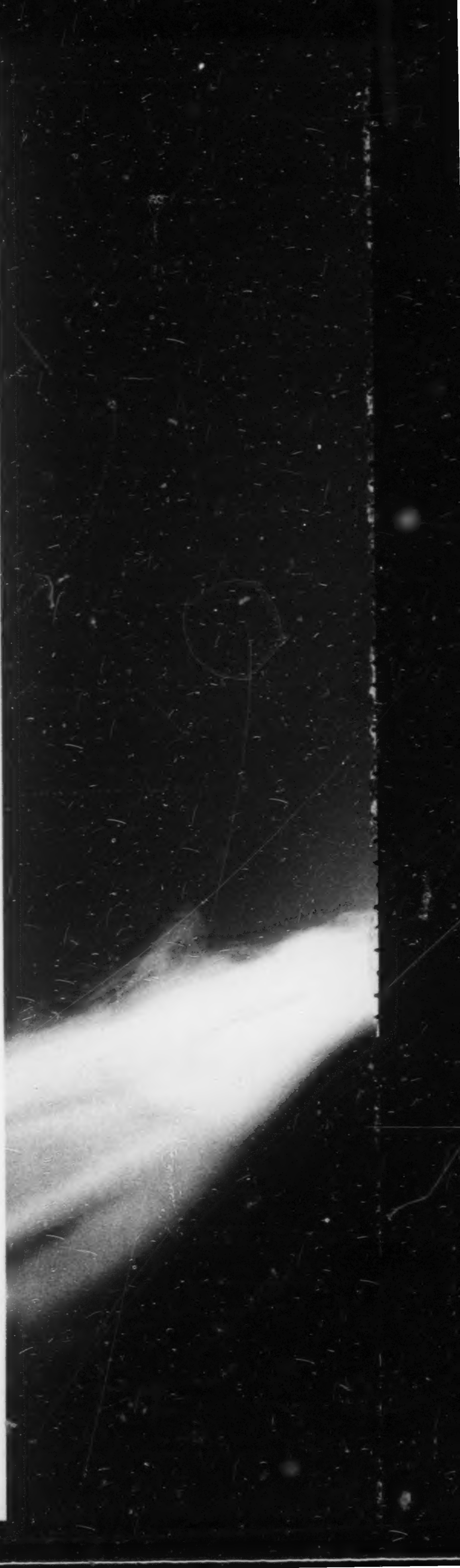
The domestic dp industry also benefitted from the favorable economic conditions in Japan. Real GNP growth was up 5.8% in 1984, while the wholesale price index for capital goods remained almost constant. The resulting upsurge in capital spending stimulated the demand for dp wares. In order to meet that demand, the Japanese stepped up local computer production by nearly 50% in 1984, according to estimates from Merrill Lynch in Tokyo.

Spending increased dramatically last year in the microcomputer sector, bringing fat returns to both NEC and Fujitsu. The brightest light in the local dp market, Fujitsu pulled in revenues of around $2.9 billion. Outshining rivals NEC and IBM, the pcm prodigy scored a 27% surge in sales in 1984. Ranking right under Fujitsu is NEC, which cashed in on the demand for microcomputers and small business machines. Sales of these wares helped NEC hike its revenues 23% to $2.4 billion last year.

DATAMATION's survey shows a heavy concentration of companies at the top of Japan's dp industry. Revenues of the top 10 firms accounted for a hefty 83% of the total Japanese dp market, which was worth an estimated $15 billion in 1984. The combined sales of the first four companies in the rankings, all major mainframe makers, represent 74% of the total revenues of the Japan top 10.

The local subsidiaries of the BUNCH companies had a tough time in Tokyo last year. Jockeying for position at the bottom of the top 10 table are the NCR and Burroughs affiliates. NCR, which chalked up a 13% revenue increase, actually did much better than Burroughs, which posted a scant 0.5% gain to $271 million.

The BUNCH company that was bruised the most in the Japanese market last year was Honeywell. Taken over by NEC in February of 1985, Honeywell Information Systems Japan had sales of only $38.7 million in 1984. Early last year NEC had granted Honeywell distribution and manufacturing rights for its Acos 1000



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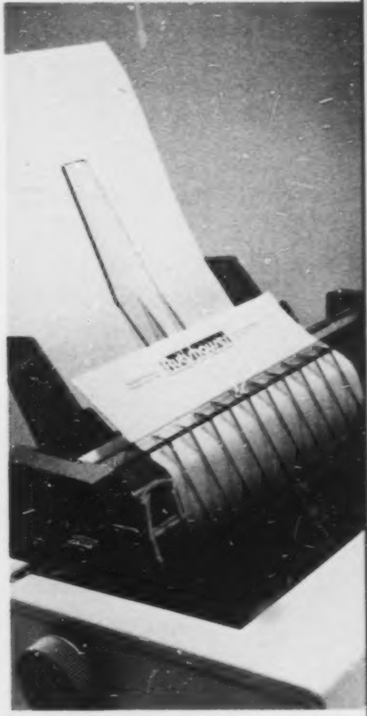

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CIRCLE 78 ON READER CARD

IBM took a beating in the Japanese mainframe replacement market last year.

FIG. 1

FASTEST GROWERS IN JAPAN

JAPAN 10 RANK	COMPANY	% CHANGE ($ MIL./Y BIL.)	JAPAN DP REV. ($ MIL.)
	Nomura Computer Systems	46.2	120.0
	Nihon Data General	29.7	44.2
	Intec	28.1	85.2
1	Fujitsu	26.7	2,860.3
	Computer Services	26.0	155.6
	Matsushita Electrical	24.2	136.8
2	NEC	23.2	2,407.5
4	Hitachi	21.8	1,759.6
	Nihon Digital Equipment	21.7	130.1
7	Oki Electric	18.3	620.8

FIG. 2

LEADING JAPANESE DP COMPANIES

		WORLDWIDE DP REV. ($ MIL)	% CHANGE ($ MIL./Y BIL.)
1	Fujitsu	3,499.7	24.9
2	NEC	2,799.4	21.7
3	Hitachi	2,199.5	29.3
4	Toshiba	1,136.6	31.6
5	Oki Electric	899.8	19.8
6	Mitsubishi Electric	817.0	16.7
7	Nippon Univac Kaisha	496.3	13.4
8	Ricoh	247.5	16.5
9	Matsushita Electrical	210.5	23.4
10	Computer Services	155.6	25.6

mainframe series. The deal also included cross-licensing of patents and copyrights.

Nippon Univac Kaisha, which is 34% owned by Sperry, racked up a respectable 13% increase in Japanese dp revenues. Slower growth at Mitsubishi Electric helped Oki to narrow the revenue gap between the two companies that hold the sixth and seventh position in the top 10. A sharp drop-off of $874.2 million separates two other local dp powers, Hitachi and Toshiba. Ranking fifth in the top 10 table, Toshiba pulled in $885.4 million in domestic dp revenue last year. Strong overseas sales of its micro peripherals products helped Toshiba boost its dp exports by more than 52% last year.

When Toshiba exited the mainframe market a decade ago, Hitachi strengthened its commitment to the pcm path. Hitachi's lead shows the advantages of selling mainframes in a market mad for MIPS. The demand for MIPS in Japan is increasing at a rate of about 50% per year, according to the country's Ministry of International Trade & Industry (MITI), which estimates that the installed mainframe base in Japan is worth around $25.5 billion.

IBM, which has roughly 26% of that installed mainframe base, is having a tough time keeping the wolves at bay. Hot on IBM's heels is Fujitsu, which has nearly 25% of the installed base, and Hitachi, which holds a 20.5% share. Coming further down the line is NEC, which has captured 13% of the installed mainframe base in Japan.

BEATING IN LOCAL MARKET

IBM Japan really took a beating last year in the local mainframe replacement market. For every replacement order it won, Fujitsu and Hitachi captured almost four. Even NEC managed to squeeze Big Blue out of a few low-end sites. Local users cited superior price-performance and Japanese language processing capability as the main reasons

The big guns in the Japanese dp domain took aim at IBM by rallying around the OSI standard.

DATAMATION'S JAPAN 10

1984 RANK	COMPANY	OWNER-SHIP	1984 JAPAN DP REV. ($ MIL.)	% CHANGE	TOTAL DP REV. ($ MIL.)	% CHANGE**	1984 TOTAL REV. ($ MIL.)
1	**Fujitsu Ltd.**	Japan	2,860.3	26.7	3,499.3	24.9	6,440.7
2	**NEC Corp.**	Japan	2,407.5	23.2	2,799.4	21.7	7,594.3
3	**IBM Japan Ltd.**	U.S.	2,229.1	17.3	44,292.0*	21.3*	45,937.0*
4	**Hitachi Ltd.**	Japan	1,759.6	21.8	2,199.5	29.3	21,048.2
5	**Toshiba Corp.**	Japan	885.4	14.6	1,136.6	31.6	13,891.8
6	**Mitsubishi Electric Corp.**	Japan	653.6	9.9	817.0	16.7	7,329.5
7	**Oki Electric Industry Co. Ltd.**	Japan	620.8	18.3	899.8	19.8	1,738.6
8	**Nippon Univac Kaisha Ltd.**	Japan/U.S.	488.8	13.4	496.3	13.4	496.3
9	**NCR Japan Ltd.**	U.S.	291.3	13.1	3,670.0*	10.1	4,074.3*
10	**Burroughs Co. Ltd.**	U.S.	271.1	0.5	4,500.0*	12.5	4,875.6*

*Includes parent company figures ** % change in $ millions/yen billions

for switching to Hitachi and Fujitsu machines.

Big Blue has been slow in providing Japanese users with language support facilities. This delinquency certainly accounted for some of the defections. For example, the 4300 series, which is manufactured in Japan, didn't get appropriate Japanese language support until last year. And even when this language support became available, Japanese users still complained that IBM was sluggish in providing the related applications software—software that Fujitsu was readily supplying.

Such sluggishness does little to endear IBM to customers in Japan, the second largest dp market in the world. Japan is also the only major dp market in the world where Big Blue doesn't dominate. With Japanese dp revenues of $2.2 billion, IBM comes in third in the top 10 survey, falling below NEC and Fujitsu, which has been number one in the Japanese dp realm since 1979.

The erosion of IBM's Japanese market share was even more evident last year as sales continued to slump. IBM responded with a major shakeup of its Japanese operation. Many Japanese senior managers were replaced by American IBMers. The company also moved its Asia/Pacific Group headquarters to Tokyo, making George H. Conrades the boss.

Hit hard at the high end of the market, IBM took even stronger punches at the low end. The same punches were also felt by Apple, which was unable to make a dent in the Japanese micro market, despite a lavish local advertising campaign. Last year the leader in the Japanese pc world was clearly NEC. And what NEC gained by garnering 40% of the local market for 16-bit micros came at the expense of IBM, which barely managed to hold on to its 13% stake. Together NEC and Fujitsu captured almost 60% of the $1.7 billion domestic micro market.

The IBM 5550 and 5540 workstations didn't give local competitors much of a run for their money either. In fact, some of the 48,000 units that were shipped last year are still bloating local dealer's inventories.

To counter the challenge posed by Fujitsu and NEC in the small business computer and micro sectors, IBM launched a marketing drive last year to create a network of value-added resellers. It also enlisted the help of local software/services companies in a campaign to beef up Japanese software support and distribution networks.

One of those companies IBM collaborated with last year was Computer Services Corp., which doesn't make the top 10 table. Nevertheless, Japan's largest independent software/services firm ranks fifth on DATAMATION's list of fastest growers in Japan (Fig. 1). Computer Services hauled in domestic dp revenues of $155.6 million, up a hearty 26%. Most of that revenue growth comes from system development work the company does for the big banks in Japan. Those big banks are wedded to IBM wares and that makes Computer Services' ties to IBM even tighter.

TWO OF FASTEST GROWERS

Two other software/services vendors not in the top 10—Nomura Computer Systems and Intec—also make the table of fastest growers. Owned by Japan's biggest securities firm, Nomura Computer Systems derives most of its money from sales of software to the financial services and retail industries. Last year those local dp revenues amounted to $120 million, up an impressive 46%.

Software/services company Intec also did well in '84, spurting up 28% to score domestic dp revenues of over $85 million. While most (45%) of the firm's revenues are from the services sector, there are signs that more of its sales will be coming from the value-added network (van) side. Intec, which was the first company in Japan to offer intracompany van services, has relied heavily on outsider GTE for communications hardware and software. Having no links to the local hardware powers, Intec could take advantage of its head start and GTE connection to become Japan's largest independent van supplier.

Another company that racked up good growth gains, but not good enough to qualify it for the top 10, was Matsushita Electrical. The company, which inked an oem deal in 1984 to supply IBM with low-cost microcomputer and workstation components, pulled in $137 million in domestic dp revenues, up over 24%.

Both Matsushita Electrical and Computer Services make it into the league of leading Japanese companies that are ranked by worldwide dp revenues (Fig. 2). Also on that table is Ricoh, with total dp sales up 16.5% to $247.5 million. Still not a major player in the Japanese dp arena, Ricoh wants to branch out into more sophisticated office automation areas. Taking a step in that direction last year, Ricoh began working with AT&T International on joint marketing ventures in microcomputers and image processing equipment.

The Ricoh-AT&T alliance was one of several cooperative couplings that were being negotiated last year between Japanese and American firms. Many of these teamups came on the telecom side. AT&T and

JAPAN DP REV. AS % OF TOTAL DP REV.	DP REV. AS % OF TOTAL REV.	NET INCOME ($ MIL.)	1984 JAPAN EMPL.	1984 TOTAL EMPL.	FISCAL YEAR END
81.7	54.3	310.0	61,750	65,000	Mar.
86.0	36.6	187.6	N.A.	78,389	Mar.
5.1	96.4	6,582.0*	15.110	394,930	Dec.
80.0	10.4	824.8	168,796	173,643	Mar.
77.9	8.1	362.1	112,000	114,000	Mar.
80.0	11.1	189.5	48,200	66,000	Mar.
69.0	51.7	44.7	17,266	17,800	Mar.
98.5	100.0	9.7	4,200	4,200	Mar.
7.9	90.0	342.6*	4,429	62,000	Nov.
6.0	92.3	244.9*	2,463	65,000	Nov.

trading giant Mitsui Corp. joined forces to battle IBM and Mitsubishi on the van front. Another Japanese trading firm, Marubeni Corp., hooked up with Tymnet to offer a van service that will be available this fall. To compete with the van force of IBM and Mitsubishi, Fujitsu and Hitachi helped rewrite portions of AT&T's Net 1000 software, adapting it for use in Japan.

All this jockeying for postion on the local telecom turf came in anticipation of last April's liberalization of Nippon Telegraph & Telephone (NTT) Public Corp. The legal reforms that came in 1984 set the stage for competition in van and common carrier services and in customer premises communications equipment.

NTT's fiber-optic trunk line that will connect all major Japanese cities also heated up competition in the software and services sector. The national Information Network System (INS), which is slated to become operational in the early 1990s, sparked greater interest in the fledgling videotex field.

The Character and Pattern Telephone Access Information Network (CAPTAIN) videotex service, jointly developed by NTT and Japan's Ministry of Post & Telecommunications (MPT), got off to an inauspicious start in late 1984, when demand was hampered by high hardware costs. Meanwhile the major Japanese dp vendors, still not wedded to CAPTAIN, are eyeing the North American Presentation Level Protocol Syntax (NAPLPS) that was developed by AT&T as an enhanced version of the original Canadian Telidon standard.

The big guns in the Japanese dp market also rallied around the International Standards Organization's open systems interconnection (OSI) standard last year. The move was aimed at wounding IBM with its SNA approach. The Japan Industrial Standards (JIS) Committee, working under the auspices of mighty MITI, formulated an OSI-based reference model for network architecture in Japan. Not to be outdone, Big Blue worked with NTT to develop OSI gateways between the PTT's Data Communications Network Architecture (DCNA) and its own SNA system.

MITI LAUNCHES CAMPAIGN

MPT, the chief architect of Japan's telecom deregulation strategy, also played a role in the standards arena last year. Working together with Digital Research Japan and Microsoft's Far East rep, ASCII Corp., MPT came up with standard protocols for micro communications software. Not content to let rival bureaucrats at MPT take over its turf, MITI launched its own campaign to promote JIS's OSI proposals.

Japanese vendors were also getting into the micro mode last year, pushing Microsoft's MSX operating system standard for 8-bit home computers. The push petered out, as prices fell and demand sagged. A dozen companies, however, managed to ship over 400,000 MSX machines to the domestic and European markets before the boom went bust.

During 1984 the top six domestic dp companies—Fujitsu, NEC, Hitachi, Toshiba, Oki, and Mitsubishi—tried to hash out a standard for a Japanese version of AT&T's Unix operating system. AT&T, NTT, and MITI were all involved in the Unix discussions. Although no formal recommendations were issued, MITI did announce plans to use Unix-based workstations and programming productivity tools in its ambitious Sigma network. Throughout the year the select six were also busy at work

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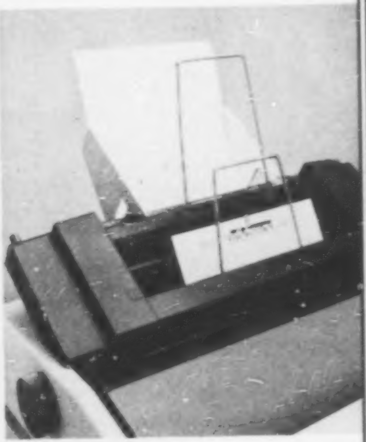

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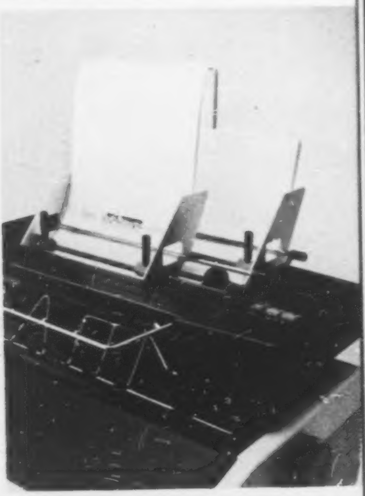

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CIRCLE 84 ON READER CARD

The dp downturn in the States could cloud the profit picture for Japan's brightest performers.

METHODOLOGY

The 1984 Japan top 10 survey was compiled exclusively by DATAMATION from information culled from an in-house database that tracks the dp results of over 200 companies worldwide.

All revenue and earnings figures have been adjusted to calendar year calculations and converted to U.S. dollars, using OECD exchange rates for the appropriate period.

The survey definition of data processing includes the following product and service categories: mainframes, minicomputers, microcomputers, office systems, data communications, peripherals and terminals, software and services, and maintenance and repair.

Explicitly excluded are data transmission or "basic" services from specialized common carriers; standalone electronic and mag card typewriters; standalone electronic cash registers; instrumentation devices; automatic test equipment; semiconductors; printed circuit boards; and data processing supplies, except for magnetic media for disks and tape drives.

For computer-based manufacturing systems, such as computer-controlled machine tools, only the computer and hardcopy output devices are included and not the tools themselves.

on Unix-based workstations.

The move to Unix could benefit Japan's minicomputer makers, who had another good year in 1984. The Japanese subsidiaries of U.S. mini manufacturers Digital Equipment and Data General also did well, scoring impressive revenue increases that qualified both of them for the fastest growers table.

Strong sales of the VAX series helped Nihon Digital Equipment chalk up a 22% increase in Japanese dp revenue, which hit the $130 million mark. Meanwhile, Nihon Data General's 30% boost pushed its Japanese dp revenues up to $44.2 million.

Last year DG set up a local factory to produce the Data General One laptop micro, which was also designed in Japan. Indeed, more and more U.S. companies are coming to Japan to take advantage of the low-cost production. Japanese dp vendors have been using those low-cost production techniques for some time. They've also been relying on the business blessings of Mother MITI.

Japan's mightiest mainframers have banded together through industrial organizations and through MITI, which gives them prominent positions on its powerful industrial structure council. MITI has helped promote more basic research in Japan by coordinating R&D cooperation among the local industry leaders.

VAUNTED R&D SCHEME The most vaunted R&D scheme to date has been MITI's Fifth Generation Computer Development Project. The results from the first phase of the project were discussed in front of an international audience in Tokyo last November. Observers at the meeting felt that the Japanese had made some definite inroads into the field of artificial intelligence, but still had a long way to go in bringing AI down to earth.

Last year NEC, Fujitsu, Mitsubishi, and Toshiba were all reportedly working on more down-to-earth applications that were spin-offs of Japan's AI research programs. But the company that may get the farthest the fastest is Hitachi. An active participant in MITI's AI research project, Hitachi has in addition a hefty $1 billion R&D budget that enables it to independently pursue its own artificial intelligence efforts.

Independence was also the name of the game last year for Japanese dp suppliers, who preferred to cement existing tieups to experimenting with new partners. With the exception of the courtship rituals that preceded the NTT liberalization, no major marriages were announced in 1984. Fujitsu and Hitachi continued to keep low profiles abroad, discreetly selling their wares through their European and American partners. And when the plug-compatible shakeout hit the U.S. market, the Japanese pcmers hardly saw a blip on their sales charts.

Those blips may be coming if the backlash over the touchy trade issue severely stems the flow of Japanese dp exports to the U.S. The dp downturn in the States could also cloud the profit picture for Japan's brightest performers. If that happened those leading lights would refocus on the home front. That could further dim the dp power of IBM in the Land of the Rising Sun. ■

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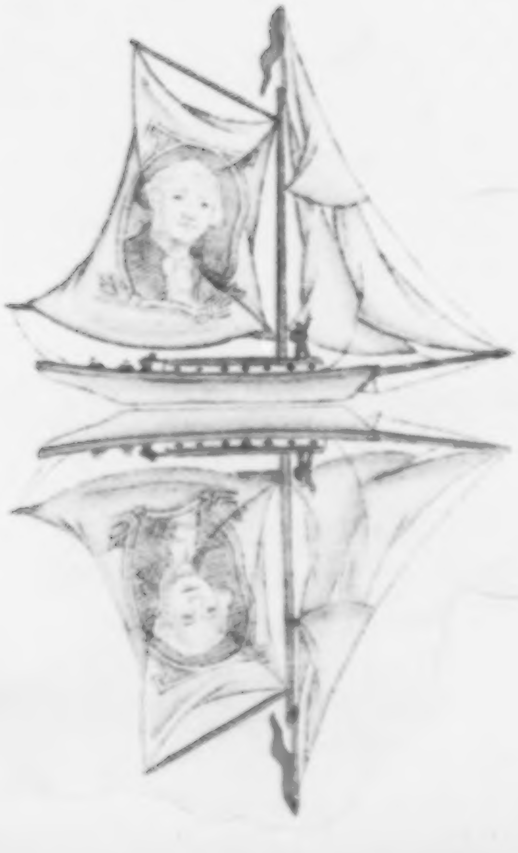

DATAMATION

SEPTEMBER 15, 1985/$3 U.S.A.
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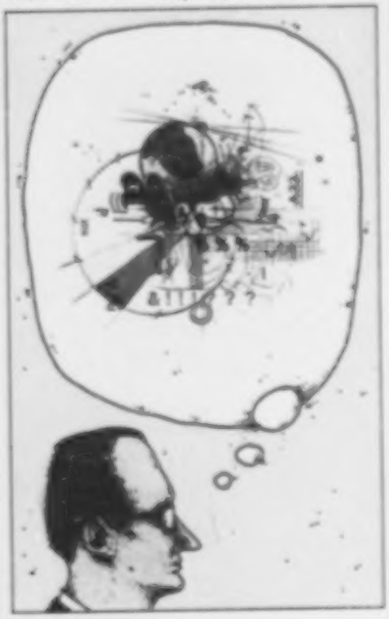
FEATURES

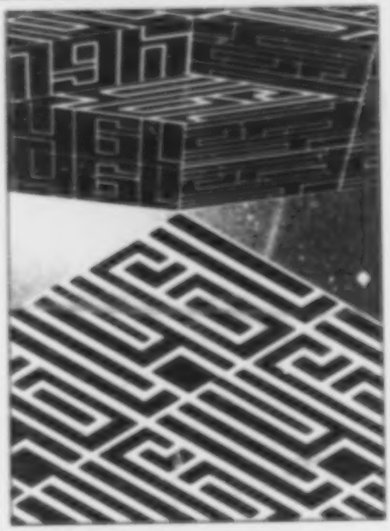
32
IN FOCUS
Laton McCartney describes "The AT&T Make-Over," as the telco continues to search for the right sales look that will enable it to compete head-to-head with IBM and the other vendors.

88
1985 DP SALARY SURVEY
This year's dp paycheck promises to be only 7.1% fatter than 1984's. That and other nifty facts inside.



105
THE DESIGNING MIND
Philip Edwards
What quirk or special gift allows one person to rattle off design ideas that are devastating in their elegance, while colleagues, apparently equally bright, labor to produce leaden structures, unwieldy and clumsy?

115
HOW TO PICK EAGLES
Robert A. Zawacki
Selecting the right person for the right job is a matter of adapting traditional interviewing techniques to high-tech situations.



118
BUILDING A FOURTH GENERATION ENVIRONMENT
Kurt A. Christoff
Sure, a 4GL is easy to install, but that's not the critical activity. Creating a comprehensive environment to manage this powerful tool is.

129
FROM ANALYSIS TO DESIGN
Jason Martin
Critics of structured techniques often complain about the difficulty of transforming the analysis model into a hierarchical design model. Here's a method to ease the pain.

139
LEARNING TO LIVE IN A DISTRIBUTED WORLD
Niv Ahituv and Batami Sadan
The desire to distribute under a controlled ddp policy rather than in a wild fashion is understandable. So are these guidelines.

152
OBJECTS AND EVENTS
Frank Sweet
Further delvings into the realm of database design in part three of a 14-part series.

NEWS IN PERSPECTIVE

42 **ARTIFICIAL INTELLIGENCE**
Can AI save COBOL?
44 **5 GLS**
Lull in the fifth.
48 **COMMUNICATIONS**
Optic net warfare.
62 **MICROCOMPUTERS**
No PC2? What instead?
68 **SOFTWARE**
End to as-is sales?
72 **INTERNATIONAL**
Vaportex goes to Japan.
81 **BENCHMARKS**
84 **WORLD WATCH**

DEPARTMENTS

8 **LOOKING BACK**
13 **LOOK AHEAD**
23 **LETTERS**
18 **CALENDAR**
29 **HARDCOPY**

154 **HARDWARE**
161 **SOFTWARE**
166 **ON THE JOB**
168 **READERS' FORUM**
172 **ADVERTISERS' INDEX**

OEM SUPPLEMENT 84-1

-2 **BRIDGING THE GAP**
-17 **NEW LIGHTS ON THE STORAGE FRONT**

COVER ILLUSTRATION BY RICHARD EGIELSKI

Products that link old and new office systems may be worth $1.5 billion by 1990.

BRIDGING THE GAP

by Edith Holmes

Over the past two years, office automation has become synonymous with personal computers tied to word processing systems, minicomputers, and mainframes. Users seeking to make the productivity promises of OA come true are beginning to put a premium on links between pieces of hardware made by different manufacturers. Indeed, "among the challenges facing users in 1985 is document distribution across incompatible machines," says Dale Kutnick, an industry consultant based in Wayland, Mass.

Fortune 1,000 companies have de-

manded technology that will mix and match such products as Wang Office, Digital Equipment Corp.'s All-in-1, Data General's CEO, Hewlett-Packard's Desk Manager, and IBM PCs running MultiMate or DisplayWrite, moving documents as well as messages from one machine to another. The new gear will tie the old office with its word processing gear to the new office dominated by micro and departmental computers and dependent on the corporate data center.

Throughout the year, so-called "bridge systems" providing connections to the IBM environment have been introduced or promised from relatively young software houses, established mini makers, and such new entrants to the computer field as AT&T Information Systems. A few bridges are up and running, but in most cases they are still experimental (see box).

Certainly, protocol converters have been around for a long time, and—broadly defined—the bridge industry must be said to include these devices. But other hardware-based solutions to the document distribution problem in the office are gaining acceptance. Two-year-old Banyon Systems Inc. of Westboro, Mass., for instance, is marketing a network server that has at its core what the company calls a virtual networking system architecture.

Banyon's server—with a 32-bit processor, up to eight megabytes of main memory, a six-slot I/O bus, as many as four 43-megabyte Winchester disk drives, a cartridge tape drive, a cartridge tape drive for backup, battery backup, and storage expansion capability—accommodates multiple, mixed communications network cards linking a variety of personal computers via different local area networks, including Xerox's Ethernet, Corvus Systems' Omninet, IBM's PC Network, and Proteon Associates' ProNet. In addition to permitting

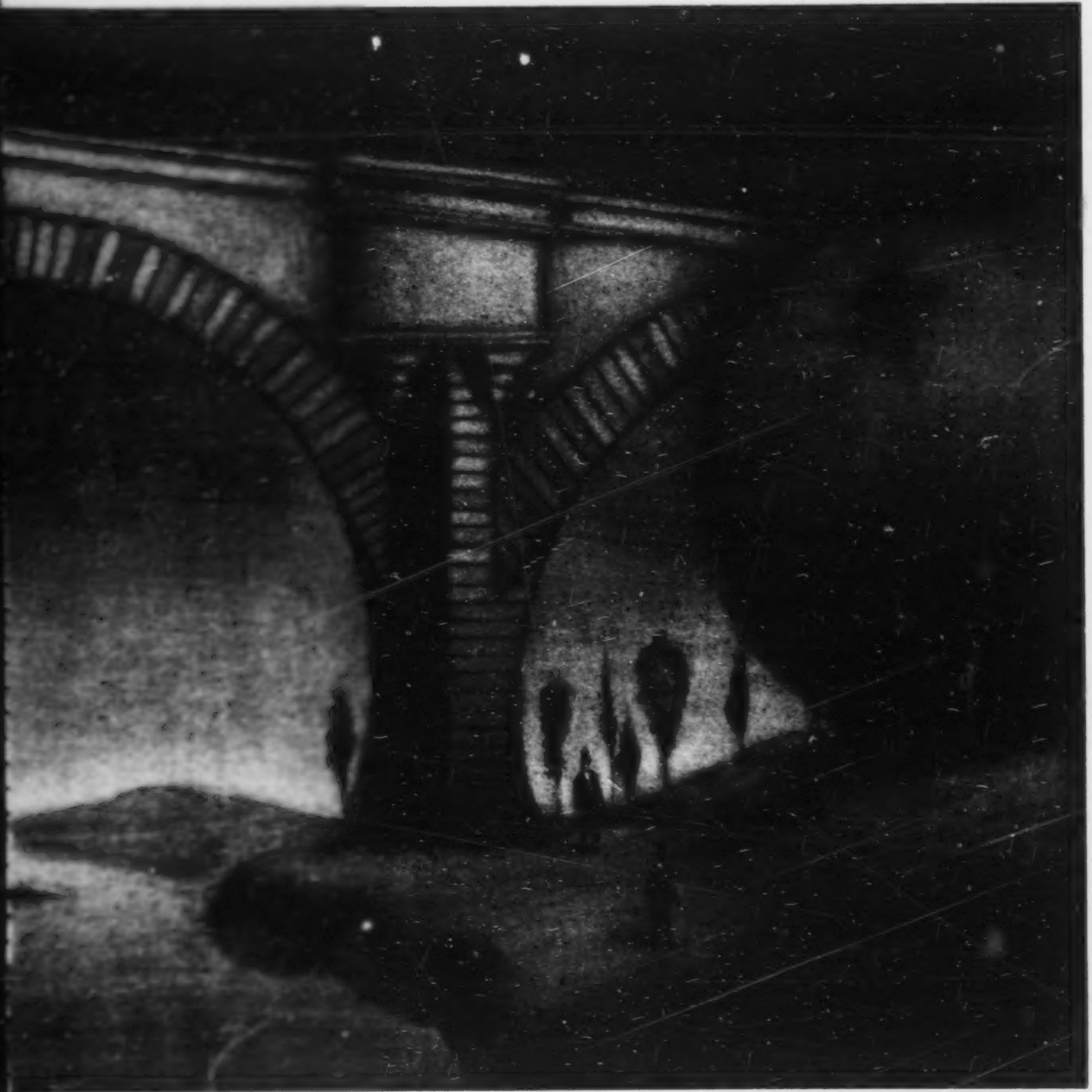


ILLUSTRATION BY DAN ADEL

"Among the challenges facing users in 1985 is document distribution across incompatible machines."

transparent, multi-user file sharing among dissimilar pcs and workstations, mainframes, and databases, the firm offers a mail feature that connects pc users to local, host-based, and public message systems.

TAKING A DIFFERENT APPROACH

Keyword Office Technologies, founded in 1979 and headquartered in Calgary, Alberta, has taken a different approach with its Keyword 7000 disk-to-disk document conversion system. A peripheral hardware device driven by an IBM or compatible computer and introduced by the firm last year, the Keyword 7000 can translate documents among word processing systems made by Lanier, AES, IBM, Wang, Xerox, DEC, NBI, and others. Last March, the company added document exchange software modules for the IBM DisplayWrite II word processing package and the IBM 5520 administrative system to its growing library of Keyword 7000 connections. And in July, Keyword unveiled a software package called COM.FILE that lets users of its disk-to-disk conversion system translate documents for transmission to remote, previously incompatible word processing systems.

Though these hardware solutions appeal to many users, analysts anticipate that between 75% and 85% of the bridge business will be made up of software products from such companies as Soft-Switch Inc. of King of Prussia, Pa., and Software Research Corp. in Natick, Mass. All told, this new industry is worth between $150 million and $200 million today. "It will hit $1 billion sometime in 1988 and reach $1.5 billion by the end of the decade," predicts George Colony, president of Forrester Research Inc. in Cambridge, Mass.

Colony and others believe that the bridge business will prove to be "an excellent niche market" for relatively new firms like Soft-Switch and SRC. Accordingly, they are recommending investment in bridge companies. But at the same time, market researchers suggest that no one in the computer field can afford to ignore these connections in the office. "Everyone—from IBM and AT&T to the mini makers—will want to get into this," says Kutnick. The question is whether the third parties in this field can successfully oem their solutions to these manufacturers, in addition to selling directly to end users.

Bridge products, particularly those from third parties, received a boost nearly a year ago when IBM unveiled its long-range office systems scheme with the Distributed Office Support System (DISOSS) at its heart. DISOSS, a host program that runs under IBM's CICS and MVS or DOS VSE, implements IBM's Document Interchange Architecture (DIA) to provide library, distribution, and application services. It is a "strategic" product for the company, says an IBM spokesman. Grateful for the sudden awareness that Big Blue's action has given his industry, Soft-Switch president and ceo Michael Zisman notes that "IBM is marketing DISOSS as aggressively as it has ever marketed any software product."

IBM's commitment to and positioning of DISOSS begins to make office links to the industry leader's environment possible by setting a de facto standard, and "raises the stakes for the mini vendors," says analyst Kutnick. "They must tie into it." No longer is the 3270 dumb terminal link between the office and the IBM-oriented data center sufficient, he suggests. Personal computers and intelligent workstations that can initiate sessions and exchange files with the mainframe or a departmental processor are the order of the day. "If you can't look like IBM in the office, you can't succeed," adds Amy D. Wohl of Wohl & Associates in Bala Cynwyd, Pa.

OA and mini suppliers acknowledge the need to provide a connection to the IBM world. "We view IBM as our major competitor in the office," says Gerry Paul, vice president of communications systems development at Wang. "Our focus is on IBM coexistence." Joe Forgione, marketing manager for communications products in Data General's Information Systems Division, agrees. "We must coexist with IBM," he says. "We're doing everything we possibly can to work with IBM mainframes."

600-700 DISOSS USERS

Estimates put the number of DISOSS users worldwide between 600 and 700; approximately 450 of these users are in the United States, agree Wohl and Kutnick. They anticipate that users will continue to test DISOSS for the next nine to 10 months and that it will enter the "mainstream" in data processing shops in 1986 or 1987 and become a user-transparent standard by 1988. In the meantime, Kutnick believes that there is "lots of room for third parties" to develop gateways to DISOSS using IBM's high-level SNA Logical Unit (LU) 6.2 program-to-program protocol and SNA Distribution Services, a distribution architecture first implemented in DISOSS 3.2.

Also responsible for the rising interest in bridge products is the current push toward departmental processors, says Zisman of Soft-Switch. Here, he suggests, the mini makers are the leaders because of the work they have done on communications architectures. Though he believes that IBM's System/36—now labeled by the company as its "general purpose departmental system with broad office function"—will increase Big Blue's market share at the office level, Zisman sees DEC, Data General, Hewlett-Packard, and even Wang stealing the march from IBM for the moment in this environment. Indeed, a Yankee Group study earlier this year shows DEC's All-in-1 office automation package leading IBM's

BRIDGES AT WORK

The breakup of the Bell System and the dawn of competition in communications has forced suppliers in the industry to offer better prices to their customers and thus to narrow their own operating margins. This holds true whether the company is AT&T or MCI or GTE.

At GTE Data Services (GTEDS), headquartered in Tampa, Fla., efficiency is the watchword. "Anything that we can do to reduce costs for the GTE telephone companies, we'll do," says Harry Barker, systems engineer with Information Sciences, the research organization within GTEDS.

Barker heads a project charged with a major cost reduction effort: the creation of a nationwide office automation network for GTEDS, a service firm whose major customers are the telephone operatiing companies ons scattered across the country. With such a network, GTEDS hopes to speed document and electronic mail delivery among the eight major computer centers that serve the phone companies. Ultimately, Barker anticipates, a system still in the experimental stage at GTEDS will become the basis for "a true corporate data net at GTE."

The foundation for GTEDS's test network is IBM's SNA Distribution Services (SNADS) and Distributed Office Support System (DISOSS). By the end of this year, Barker expects four or five of his company's data centers to be lashed together via SNADS and exchanging mail with DISOSS. Largely equipped with multiple IBM 308X and compatible processors, these computer operations include centers located in Tampa; Fort Wayne, Ind.; Erie, Pa.; Durham, N.C.; and Everett, Wash.

"When we talk about tying the whole office automation kludge together, we're dealing with far more than a local area network," says Barker. "We need to create a corporate repository for information; we need a host-based system."

GTEDS has finished installing and testing DISOSS 3.2—IBM's first implementation of DISOSS-to-DISOSS, peer-to-peer document exchange—at four of its centers. The company will be testing initial DISOSS-to-DISOSS, host-to-host document exchange in the fourth quarter of 1985. The next step is data center to data center exchange.

In addition, Barker's project is working to tie IBM DisplayWriters, office department processors in the System/36 class, 3270-type terminals, pcs, and host printers to the mainframes at each center. It will follow up by connecting Wang VS systems, the several types of IBM PCs and compatibles such as Compaq running MultiMate and DisplayWrite II word processing packages. Says Barker, "Sooner or later, Apple's Macintosh will probably become a real player in our network. We have quite a few Macs around to do graphics tasks."

To link most of its non-Blue equipment to the office automation network, GTEDS is using bridge software from Soft-Switch Inc. of King of Prussia, Pa. Soft-Switch packages are in place in two sites that have non-IBM gear—Tampa and Fort Wayne.

"We scoured the marketplace, looking for anything that would hook up our different machines," Barker recalls. "We considered hardware-based solutions," such as the disk conversion system offered by Keyword Office Technologies of Calgary, Alberta. "These products probably have a place at GTE. But for now, we want to be able to integrate our solution in a network," he explains.

GTEDS found there weren't many companies capable of offering the range of translation options, the "document fidelity" that Soft-Switch provides. Also, in business for awhile, the software house "is well established," says Barker. "We're always looking for stability" in suppliers.

Finally, Soft-Switch's approach to the problem of interconnecting devices made by different manufacturers happened to coincide with GTEDS's philosophy on this particular subject. Both supplier and end user believe in tying their office automation systems to mainframes that can provide the computing power for complex translations and large databases.

But even Soft-Switch didn't pass muster when Barker's group first considered its products. "When they incorporated mail into their document control system, tying their distribution system to the DISOSS distribution system, [then] Soft-Switch offered what we needed," he notes.

And the product has not been without glitches. When GTEDS implemented Soft-Switch's DISOSS bridge, "we found we couldn't exchange documents with DISOSS PC, IBM's 3270 terminal software, because it only works with final form documents," says Barker. "Soft-Switch's package only worked with revisable documents." The Pennsylvania firm immediately began work on a final form translator to solve the document exchange problem.

GTED's early efforts in developing an office automation network were funded from R&D money, including the initial Soft-Switch installation in Tampa. Although the company's actual costs are unavailable, Barker expects a large portion of the expense of any bridging installation will consist of the cost of translator software.

He cautions other end users that deciding whether to buy multiple translators requires considerable justification.

In Tampa, GTEDS has only one Wang VS system—hardly the equipment population normally needed to justify spending the money for a link into DISOSS. But it happens that the Wang gear is the basis for a large printing operation at GTEDS headquarters that includes system documentation for the data centers. Ultimately, the GTE unit hopes to generate savings from its office automation network by using it to distribute documentation to its computer operations and telephone company users.

BARKER OF GTEDS: A corporate repository for information requries a host-based OA system.

Whether GTEDS will continue to buy products from Soft-Switch, develop links itself, or look to the hardware manufacturers for connections in the office is an open question. Periodically, Soft-Switch has asked GTEDS to beta test newly developed interfaces, and GTEDS has done so for several packages.

GTEDS' Information Sciences group is doing some prototype work of its own, developing a software gateway for applications outside the document exchange environment that will permit users to enter output from data processing applications into the document distribution system for delivery. Here, Soft-Switch is working closely with GTEDS to create this interface.

In the meantime, "many of the [hardware] vendors are popping new link products out of the hopper right now," says Barker. "Some of them may offer what Soft-Switch does today."

—E.H.

Professional Office Systems (PROFS) in installations this year. Links to DISOSS would only enhance the standing of the mini vendors' office systems (see Fig. 1).

There are currently only a handful of companies offering software to connect the machines of differing manufacturers. Soft-Switch is perhaps the best known and the largest of the third-party software houses building bridge products today. Founded by Zisman in 1979, the company's product's center around a document control system running on an IBM host under MVS or VM. The system provides document interchange—including translation, distribution, and library services—for a variety of word processors, personal computers, and IBM host-based terminals. Beyond IBM, the vendors whose machines Soft-Switch accommodates include Wang, Xerox, and NBI. The company also supports MultiMate and DisplayWrite II.

First offering support for IBM's Document Content Architecture (DCA) in 1983, Soft-Switch extended its product line last year to incorporate IBM's DIA and to provide a PROFS connection. The new PROFS software transfers documents in revisable form between PROFS users and other Soft-Switch users. Earlier this year, Soft-Switch introduced its DISOSS connection, followed by an enhancement to the PROFS link, permitting the exchange of messages

FIG. 1

U.S. OA PACKAGE INSTALLATION FORECAST

(1983 through 1989)

VENDOR	1983	1984	1985	1986	1987	1988	1989	AGGREGATE CHANGE (%)
IBM PROFS/PS	250	650	4,000	11,900	23,250	38,700	52,250	143.6
IBM DOSF	500	1,400	2,800	4,675	6,000	5,375	5,500	49.1
DEC All-In-1	400	1,200	4,400	10,625	20,610	32,250	44,000	118.9
Wang Office	500	1,500	3,800	7,650	12,750	17,200	22,000	87.9
Data General CEO	200	1,000	3,000	6,800	12,750	19,350	24,750	123.2
Hewlett-Packard	250	750	2,600	6,375	13,500	20,425	27,500	118.9
Datapoint	400	850	2,160	4,165	6,450	8,815	11,000	73.7
Four-Phase	200	325	800	1,700	3,000	4,300	5,500	73.7
Sperry	100	250	640	1,275	2,250	3,225	4,125	85.9
Honeywell	100	250	640	1,275	2,250	3,225	4,125	85.9
Prime	50	175	560	1,360	3,000	5,160	6,875	127.2
In-House	500	1,100	2,600	4,250	6,750	7,525	6,875	54.8
Other	1,500	4,500	12,000	22,950	37,500	49,450	60,500	85.2
TOTAL	**4,950**	**13,950**	**40,000**	**85,000**	**150,000**	**215,000**	**275,000**	**95.3%**
ANNUAL CHANGE		**181.8%**	**186.7%**	**112.5%**	**76.5%**	**43.3%**	**27.9%**	

Source: the Yankee Group, February 1985

and final form as well as revisable documents. The company also now supports All-in-1. This month, Soft-Switch plans to ship an integrated version of its products and transNET, an SNA-based document interchange system developed by Austin, Texas-based Network Applications Inc., a competitor in the bridge business acquired in May by Soft-Switch.

End users typically pay $49,000 in licensing fees for an introductory set of Soft-Switch modules. The firm has reached oem deals for prices ranging from $150,000 to $750,000, says Donald Fisher, director of oem sales. Soft-Switch has more than 60 end users and half a dozen oems. Its products are also being used by value-added networks, such as Unicall, a U.S. subsidiary of the French Compagnie Internationale de Services en Informatique. Further, they are being marketed in the United Kingdom under a joint marketing agreement with Soft-Switch Ltd.

COURTING SOME NEW CLIENTS

Just one year old, Soft-Switch's oem operation is actively courting new clients, says Fisher. "We're talking with some OA vendors about how they can successfully meet the requirement to provide DISOSS compatibility." Soft-Switch already counts Wang and Tandem among its oems. Wang introduced a DISOSS link for its Wang Office in April, as well as a PROFS gateway for Wang VS, and a Wang VS/SNA gateway. The firm depended, in part, on translator technology licensed from Soft-Switch, says Paul. The software house is also working closely with AT&T to develop a DISOSS interface to the Unix operating system. Its version will be delivered to AT&T before the end of the year, says Zisman. "Unix," he adds, "is clearly going to be important in the office."

Going head-to-head with Soft-Switch for the bridge business and scheduled to introduce a global network software product this month is Software Research Corp. Two banks in New York and Boston and two Boston-based insurance companies are currently pilot testing what SRC calls the Strategic Network Environment, or SNE. This bridge provides network file transfer software that enables users to move data among DEC VMS computers, IBM mainframes running MVS, Wang VS machines, and IBM-compatible personal computers. "By the beginning of the year, we will support IBM VM and Wang OIS," says Mike Valvo, SRC's manager of sales support. "Ultimately, we expect to support Data General and Hewlett-Packard. We want to support as many machines out there as possible."

Described as an "architecturally based solution," SNE is intended to be consistent with all existing architectures, Valvo explains. "SNE floats on top of them, extending them, complementing what is already there." A copy of SNE resides in every machine, and devices talk to each other through its high-level protocol. Users can request SNE in an on-line session or during a batch job. It will provide interfaces to a variety of database management systems and will handle electronic messages.

The first two products in the SNE software family will be the Base Module, which performs and administers the exchange of information, and the File Transfer Module, which allows files to be exchanged between dissimilar computers operating different applications. Prices are still being set, but the company anticipates, for example, that it will charge $17,000 per mainframe for the host-to-host MVS file transfer portion of SNE.

SRC plans to market its new product directly to corporations worldwide and to oem vendors. The firm has yet to sign any SNE oems. "We're in the process of talking to them," notes Carol Mazuy, director of corporate communications and marketing services. "One of the reasons we've decided to go with a direct sales force is to entice oem vendors by selling to end users first." SRC expects to have 30 end-user installations up and running with SNE by the end of the first quarter of 1986.

Until now, all of SRC's sales have been to oems. Founded in 1978 as a consulting service company with particular expertise in IBM technology, SRC delivered its first bridge product earlier this year. Dubbed Docupower, this software package is a DISOSS bridge that links computers made by AT&T, Burroughs, Datapoint, DEC, Harris, Honeywell, NBI, and Wang to IBM's office support software. The bridge extends DISOSS to the machines of Atlanta-based Lanier Business Products Inc. and other terminals as well.

Four-Phase Systems Inc. in Cupertino, Calif., and Lanier are among Docupower's oems. Four-Phase, a subsidiary of Motorola Inc., introduced a DISOSS link for Motorola 4000/5000 minicomputers last June. Its TransText software bridge is based, in part, on Docupower. "Some of our oems and others view Docupower as an interim solution on the way to SNE," says Mazuy.

OTHER COMPANIES ENTER TOO

While SRC and Soft-Switch offer the most comprehensive software solutions, other companies have entered this end of the bridge business and are attracting major oem customers. Though Soft-Switch is building AT&T's DISOSS link, for instance, System Strategies Inc. of New York wrote the SNA and bisynchronous 3270 emulator programs and the 3270 application program interface that AT&T announced in June to

Between 75% and 85% of the bridge business will be made up of software products.

link its 3B mini line to IBM mainframes.

Among the other bridge companies that bear watching are Communications Solutions Inc. of San Jose and Systems Center Inc. in Dallas. In operation for six years, CSI has built its reputation among computer manufacturers with 3270 emulation packages. It has some 80 oem customers for these products, including AT&T, NBI, NCR, and Tandem, says Donald Czubek, vice president of the firm. This month, CSI will begin shipping two products introduced in June and aimed at IBM's office environment. Access/SNA APPC emulates IBM's Advanced Program-to-Program protocol (LU 6.2) to allow application programs to communicate with one another. Access/DIA lets workstation products perform office functions compatible with IBM's DIA. "Unlike our competitors who use mainframe-based software, our approach," explains Czubek, "is to make the workstation DISOSS-compatible. In the long run, we don't believe hardware manufacturers are going to need that mainframe software." CSI's new programs will sell for $350 each in quantities of 500.

Another group of software houses has yet to offer DISOSS links but provides file transfer products for the IBM SNA environment. Four-year-old Systems Center is one such company. Its Network DataMover competes with such products as IBM's own Bulk Data Transfer and OnLine Systems Inc.'s Telefile. At the head of the family is Network DataMover-MVS, which operates on IBM mainframes under the MVS operating system. A Network DataMover-PC program runs on IBM PCs and compatibles to provide micro-to-mainframe data transfer. Among the connections Systems Center supports are an IRMA coax attachment via an IBM 3274 controller and the Corvus Systems Omninet LAN using the Omninet-SNA gateway.

PAUL OF WANG: "Our focus is on IBM coexistence."

The fledgling bridge industry has yet to be invaded by major software houses like Cullinet Software of Westwood, Mass. "We're considering a link of our own between our Information Center Management System [ICMS] software and IBM's DISOSS," says Eugene Kaplan, product manager for systems development at Cullinet. "We realize the importance of DISOSS, but we're not 100% committed to it yet." DISOSS probably will be incorporated in a future release of ICMS. Meanwhile, Cullinet has agreements with Data General, DEC, Wang, and Hewlett-Packard to create products linking their office automation systems to ICMS. So far, only one of these products has been announced: Data General unveiled its AOS/VS Decision Connection last February.

Despite the entrance of third-party bridge products into the market, some major hardware manufacturers prefer to develop links into DISOSS and other environments on their own. In July, for example, DEC took the wraps off a DISOSS option for its All-in-1 office software. Called EDE (External Document Exchange) with DISOSS, this bridge translates revisable and final form documents stored in an IBM host library into revisable form WPS-PLUS and DECdx VAX/VMS documents. Similarly, documents can be created on DEC systems, transformed into IBM final or revisable form DCA DISOSS documents, and then filed into an IBM host document library. EDE with DISOSS complements DEC's DISOSS Document Exchange Facility, which was introduced last fall and enables users on a DECnet network to read but not revise DISOSS documents. The new DEC software is priced between $3,000 and $4,500, depending on the VAX system configuration.

DEC has not precluded the use of outside software houses. "We expect to develop many more exchange products and will look for the best alternative to connect to other vendors," says a DEC spokeswoman. "If that solution comes from a third party, we'll certainly look at it."

Correspondingly, Hewlett-Packard is doing all the work for a DISOSS link to its HP Desk Manager office system, which runs on the HP 3000. "We expect to achieve full LU 6.2 implementation by the end of 1986," says David Townsend, marketing manager for HP's Office Productivity Division in Tinewood, England, where the bridge is being built. The firm is enlisting the aid of a major British software house, however, to devise a link between IBM's PROFS and Desk Manager. Hewlett-Packard already has links to Wang's OIS and Telex systems and points to its agreement with Cullinet as further evidence of its interest in connecting with others, regardless of where the ties are fashioned.

FORGIONE OF DATA GENERAL: CEO-DISOSS link—a "strategic product" for the company.

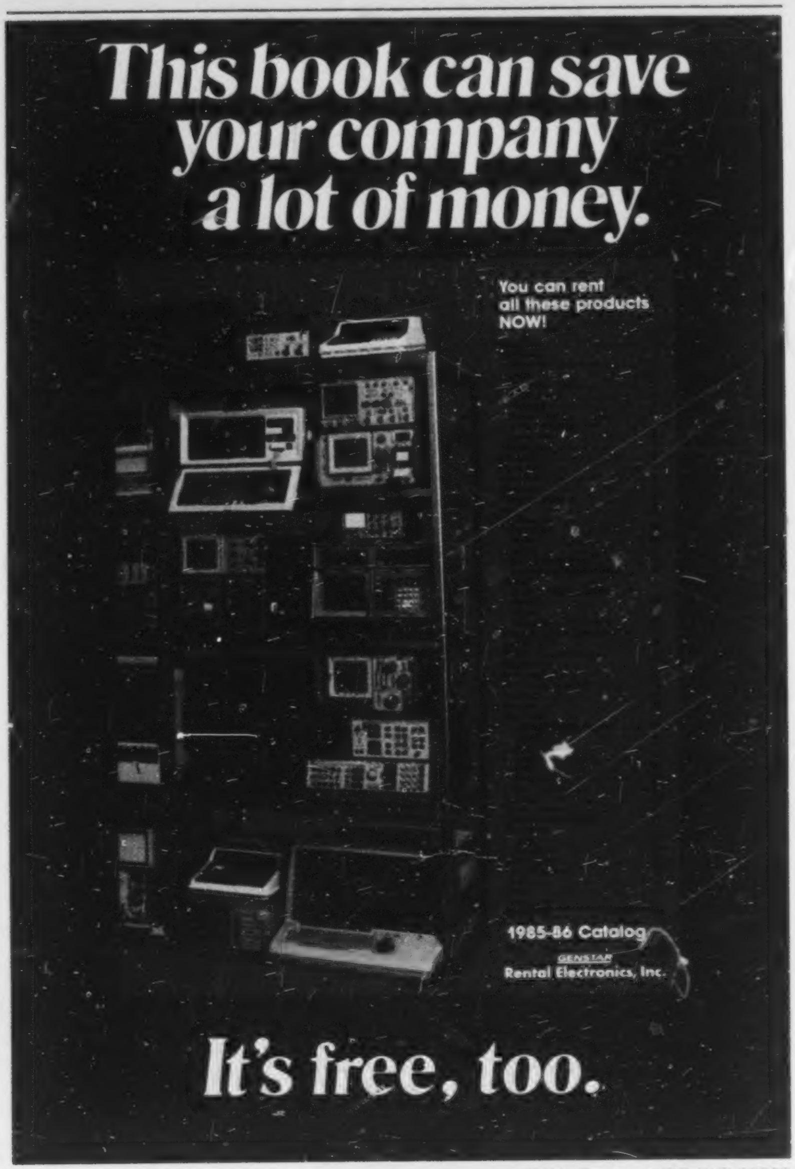
PREFER TO DEVELOP IN-HOUSE

Other firms say up front that they prefer to develop their own connections. Data General announced in April that it would build a DISOSS link to CEO, its office software, and last month unveiled the CEO Document Exchange Architecture (DXA).

"We're developing it internally because we consider it to be a strategic product," says the company's Forgione. "It had to be integrated with our office software. In the long term, we believe we're in a better position to support the product if we develop it ourselves. It may take a little longer, but we think we'll have a better product."

Data General is also evaluating a CEO-to-PROFS product that, if offered, will be developed in-house as well. The company has already devised document exchange schemes between CEO and Wang's OIS and MCI Mail, among others.

Though Wang, AT&T, and others have relied heavily on outside software houses, the courses taken by DEC, Hewlett-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CIRCLE 76 ON READER CARD

Packard, and Data General support the view of some industry observers that those in the third-party bridge business are in their heyday right now. "These companies exist today because of the chaos that is present in the offices of major accounts," says a manager for one hardware maker. "But what will happen to them over the next few years as manufacturers adopt standards such as DIA, DCA, and the [International Standards Organization's] Open Systems Interconnection model? They're trying to secure their future by oeming to us now when bridges are necessities while we work toward standards."

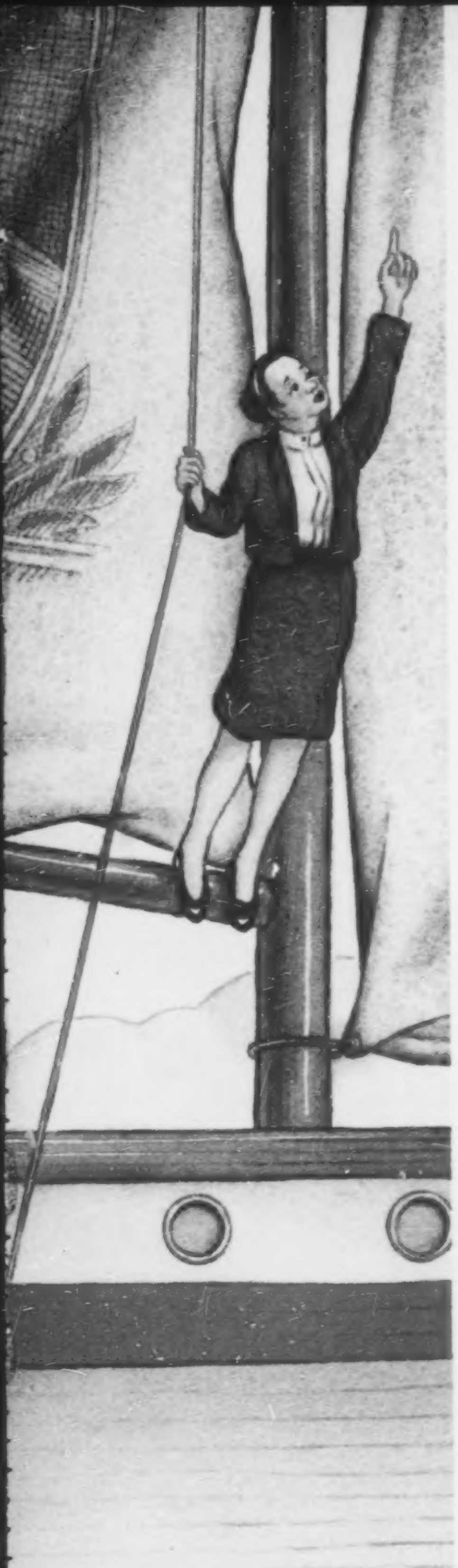
When asked whether they worry about the loss of business or competition from their oems, the third-party companies reply that their business goes beyond DISOSS links, and even translation software. "We're in the office automation interconnect business," says Zisman of Soft-Switch. "We provide IBM mainframe applications in the OA environment." Adds the company's Fisher, "Plain text, revisable document exchange with DISOSS is what the market is focusing on today. Sure, there are some limitations to the product life cycle in this field. We recognize that and we have an active R&D effort. We're working on developing a whole range of compound document exchange products and on bridges that will tie private electronic mail systems to public systems."

"No vendor, whether it's IBM or DEC or Wang, is going to want to build something that is going to help the other," reasons Valvo of SRC. "AT&T is the only supplier we can think of that would consider doing that." Adds the firm's Mazuy, "We wouldn't be so presumptuous as to compete with IBM or AT&T. We add value to what they are doing."

Further, the trend—now from Apple down through the alphabet of vendors—is to buy components from third parties, notes CSI's Czubek. "The cost of development and the compressed life cycles of these products make reinventing the wheel unreasonable." DISOSS and other links, he argues, "are like operating systems—they're something hardware manufactures need, but they aren't unique." While DEC is in the lead among mini makers with EDE with DISOSS, Wang, Hewlett-Packard, Data General, AT&T, and others have some distance to go.

Oem sales also may go well beyond traditional computer vendors in this broad, horizontal field, Czubek suggests. "With these OA products, we're starting to get into markets we were never concerned about before. Now, anyone with anything that exists in the office and needs to communicate with the mainframe is a prospective client." ◉

Reprints of this article may be obtained by calling Suzanne Tecza, (212) 605-9731.



As the economy slips gears, so do pay increases.

1985 DP SALARY SURVEY

With the national economy sputtering and occasionally stalling, salaries in the data processing business are growing, but not quite as fast as last year. Then, with economic growth a bit more robust, the average dp salary in the U.S. rose 7.3% over 1983's level. But this year's paychecks promise to be only 7.1% fatter than 1984's.

That's the main finding of the 1985 DATAMATION Salary Survey, which paid particular attention to perquisites and benefits offered to dpers of all ranks. Perks remain strong additions to the take-home pay of most managers, analysts, and programmers this year and are expected to retain their importance in years to come. For the first time, this year's survey takes a look at telecommunications salaries, an area that is sure to become increasingly important.

While dp becomes more important to business each day, so do the salaries paid to its practitioners. But indications are that in efforts to keep down labor costs, tighter controls are being placed on wages and benefits.

The slowing of growth in average salaries this year as compared with last was found in just about all metropolitan areas across the country. Rises were found in Los Angeles, where average salaries were found to be up 9.7% this year, compared to 9.0% in 1984, and in the economically robust areas of Boston, Manhattan, Philadelphia, Cleveland, Detroit, and San Francisco. According to the survey, workers in the areas of Seattle, Minneapolis/St. Paul, and Detroit see the smallest salary increases, perhaps because their local industries are not as healthy as those elsewhere.

For instance, a senior systems analyst in the New York metropolitan area, which excludes Manhattan, was found to be making an average of $38,000, while the same job category in Dallas/Fort Worth came in at only $31,960. In Boston, the figure was $30,250.

Evidently, inflation has been put under control—it is now estimated to be only 5% annually by the Conference Board, a New York business services organization—and that has helped senior management justify lower pay increases for dp and other professional staffs. Moreover, says the board, "Pressures springing from intense competition will continue to force companies to emphasize efficiency drives throughout 1985, which will keep the brakes on compensation gains." Even computer professionals, expected by some last year to enjoy double-digit pay increases as their importance was further recognized by management, will have to settle for less than might earlier have been hoped.

When looked at in terms of industry sector, the 1985 salary increases were expected to be highest in the distribution and edp services sectors (9.1% and 8.8%, respectively), reflecting the strength of those two sectors as a whole. Moreover, edp service firms tend to employ top-level personnel who, because they are specialists, can command high salaries. The slowest moving salaries will be seen in government and transportation/utility sectors, according to the survey; the increases there were rated at only 4.7% and 5.5%, respectively.

In general, negotiated pay raises have been low in recent years, according to statistics compiled by the Department of Labor. Whereas raises were 7.9% in 1981, they fell to 3.6% the next year, and were down to only 2.3% in 1984. Nevertheless, the growth of dp professional staffs, firmly rooted in the high-technology phenomenon, continues. The Data Processing Management Association of Park Ridge, Ill., found early this year that 42% of its members worldwide planned to boost their staff size this year while 54% said they would

ILLUSTRATION BY RICHARD EGIELSKI

Perks remain strong additions to take-home pay.

SURVEY METHOD

The 1985 DATAMATION salary survey began in June with a letter sent to 5,000 dp officials in the United States, drawn at random from the magazine's list of 60,000 top managers at computer sites throughout the country. Enclosed with the letter was a four-page questionnaire and a token financial incentive.

A total of 589 key officials returned completed questionnaires, providing information on salaries, benefits, and perquisites for 45 discrete dp positions in various industries and metropolitan areas.

Information was also collected on work experience, annual dp budgets, and turnover rates, among other factors. About three fifths of the respondents described themselves as dp managers.

As shown in the accompanying tables, the most important labor pools covered by the survey were those in Boston, New York (divided into Manhattan and its environs), Philadelphia, Washington/Baltimore, Atlanta, Denver, Houston, Dallas/Ft. Worth, Chicago, Minneapolis/St. Paul, Cleveland, Cincinnati/Columbus, Detroit, St. Louis, Seattle, San Francisco/Silicon Valley, and Los Angeles. The salary and other data were also broken down by industry category.

Most of the dp shops responding to the survey listed their annual budgets as less than $1 million. The average number of full-time dp professionals employed at each shop this year is 19.2, up from 18 in last year's survey. The number of temporary employees this year is 7.1, compared with 4.8 last year.

In terms of industry category, the largest representation in this year's survey came from 66 consumer and 93 industrial manufacturing companies (a combined share of 27% of the respondents), followed by 62 edp services and 62 educational (10.5% each) sites.

maintain current size. On average, DPMA found that 6.5 individuals would be hired at each member site, with an average of 3.5 of those professionals hired to fill new positions and the three others recruited to fill vacancies. As might be expected during the ongoing applications crush, a large portion (40%) of those being hired were programmers, after which came systems analysts. Personnel budgets, the DPMA survey found, comprise two fifths of the annual dp budget. Those budgets averaged $2.1 million and represented, on average, 6.5% of total corporate revenues.

BIG SHOP MEANS BIG PAYCHECK

Not surprisingly, the bigger the dp shop, the bigger the paycheck one can expect in every job category. This year's survey divided the dp shop spectrum into those that spend more than $1 million a year and those that spend less.

The differences in pay between those two categories can be quite pronounced. The typical dp vice president in the small shop was found to be earning a base salary of $51,272, while the veep in a larger shop brought home $66,089. The manager of operating systems programming could be making over $42,000 on average in a large organization, while the same job in a submegabuck shop would bring in only just over $34,000.

The reason for this discrepancy between pay in small and large dp shops has to do more with varying requirements of technical sophistication than with the mere number of dollars available for salaries. Large shops tend to have the most complex telecommunications networks, database structures, and operating systems environments, all of which need careful nurturing. No doubt some small shops are technically sophisticated, but many are still essentially batch processing operations.

For all managerial slots measured by the survey, the years of dp experience are double digit. The typical dp vice president, for instance, has 13 years under his or her belt, while the director of dp or MIS has 15.2 years. The manager of systems analysis/programming has an average of 11.8 years of experience while the manager of computer operations ranks in at 12 years. The low person on the totem pole, the junior applications programmer, has an average of 1.9 years at work, while the junior systems analyst/programmer has only 1.8 years.

Concurrent with the slight dip in growth rate of overall salaries is a decline in the turnover rate of professional staff. In both systems development and operations, survey respondents indicated that fewer job positions need filling. As the national economy's growth slows, people apparently change jobs less frequently. While respondents said that last year their lineups saw an overall change of 11%, this year's figure is down to 9.7%. Whether or not that dip in the turnover rate is a momentary one or permanent is a matter of speculation.

Says Joan Bernstein, manager of dp at Robert Half International, a nationwide recruiting firm based in New York, "Most of the movement is people moving from one career to another. While we're seeing a downturn for many of those people working in computer vendors hurt by the recent slump, others in healthy industries can make good increases by moving from company to company. We've seen companies fighting over people, throwing perks at them left and right."

Bernstein notes that as the size of on-line databases grows, demand grows for specialists in fourth generation languages, micro-to-mainframe links, and various forms of telecommunications. The latter, she says, command salaries that are "astronomical. People go the route for the person they want," she states, noting that signing bonuses is not uncommon as a lure to particularly sought after individuals.

Data communications managers and analysts are, in fact, increasingly part of the overall dp structure in large corporations as organizations move to on-line transaction processing systems, distributed processing networks, and other forms of computing that require machines to be connected over long distances. It is easy to foresee the day when telecommunications becomes merged completely into the management information system infrastructure, with reporting lines running directly into the highest echelons of dp management. For now, however, only partial samples of

FIG. 1

ANNUAL SALARY INCREASES

(IN PERCENT)

	1984	1985
Boston	7.6	7.9
Manhattan	8.1	9.9
NYC Metro	7.8	7.2
Philadelphia	6.7	7.4
Wash./Balt.	7.6	7.2
Atlanta	7.7	7.2
Denver	7.5	6.3
Houston	7.3	6.9
Dallas/Fort Worth	8.4	6.4
Chicago	6.7	6.4
Minn./St. Paul	5.9	6.0
Cleveland	6.6	6.9
Cin./Col.	8.1	6.2
Detroit	5.7	6.0
St. Louis	5.6	6.9
Seattle	5.7	4.8
San Francisco	9.4	9.6
Los Angeles	9.0	9.7
Total Sample	7.3	7.1

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Circle 100 on Reader Card
PL/1 to COBOL
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Circle 102 on Reader Card
RPG/RPG II to PL/1
Circle 103 on Reader Card
DOS to OS
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FIG. 2

BENEFITS AND PERQUISITES

(IN PERCENT)

	AVAILABLE		IF AVAILABLE, TO	
	YES	NO	MGMT ONLY	MGMT & STAFF
Medical	96.9	1.9	2.2	86.1
Dental	61.8	30.4	1.7	54.7
Disability	85.9	9.0	5.9	72.8
Life Insurance	90.3	6.5	7.0	75.9
Paid Vacation	96.4	1.9	1.7	85.9
Overtime	60.4	29.9	1.4	34.3
Profit Sharing	37.2	48.2	9.7	25.3
Investment Plan	33.3	49.1	3.4	27.7
Stock Options	21.2	59.2	13.1	7.6
Stock Discount	10.0	67.1	2.2	7.3
Pension	67.7	22.9	3.1	58.2
Signing Bonus	9.8	66.4	5.6	3.9
Longevity Bonus	13.8	66.2	3.1	9.2
Club Membership	14.6	65.2	10.5	3.4
Recreational Facilities	14.8	65.7	2.2	11.2
Automobile	30.1	53.7	26.0	3.2

FIG. 3

TURNOVER RATES FOR PROFESSIONAL STAFF

(IN PERCENT)

	DEVELOPMENTAL		OPERATIONS		OVERALL	
	1984	1985	1984	1985	1984	1985
Boston	14.5	7.8	4.2	14.3	7.3	8.8
Manhattan	18.8	13.3	10.0	24.6	25.5	24.8
NYC Metro	12.3	8.4	9.9	7.3	13.5	10.4
Philadelphia	4.3	8.3	7.5	4.1	7.3	5.3
Wash./Balt.	6.5	9.3	7.5	7.0	8.8	11.8
Atlanta	8.5	6.8	8.2	3.8	7.3	9.2
Denver	4.2	4.8	5.5	7.3	8.4	9.1
Houston	8.3	10.0	11.2	13.3	12.2	13.3
Dallas/Fort Worth	21.9	11.4	14.3	20.4	22.1	17.3
Chicago	11.2	7.4	9.0	4.9	13.3	7.7
Minn./St. Paul	7.6	15.0	18.9	11.1	15.9	14.0
Cleveland	7.2	7.6	3.7	4.7	10.8	4.7
Cin./Col.	8.3	6.3	3.8	8.5	8.2	11.1
Detroit	11.4	22.5	3.5	6.5	4.5	14.1
St. Louis	13.6	5.5	1.1	0.8	7.5	6.9
Seattle	16.6	7.7	9.0	7.3	12.4	8.0
San Francisco	13.8	7.6	11.4	5.5	12.3	6.6
Los Angeles	13.0	9.1	11.7	7.3	8.6	7.2
Total Sample	10.7	8.5	9.3	7.9	11.0	9.7

telecom salary data are available; apparently, in many industrial sectors there is a strong enough delineation between telecom and dp to keep the latter's management from knowing too much about how well the former is paid.

In those sectors that did report on telecom, the telecom manager was found to have an average base salary of $42,322. The range of salaries for the post was measured as running from $32,600 in Seattle to $70,000 in Philadelphia. The average salary for telecom analysts was put at about $28,300, with those in manufacturing and services evidently bringing in the biggest bucks. Says Bernstein at Robert Half, "People who know VTAM [an IBM telecommunications system] are in particular demand these days."

With the AT&T divestiture and increased competition from IBM and others having fragmented the telecom market immeasurably, it is not surprising to find knowledgeable persons in such demand.

FIG. 4

AVERAGE SALARY BY INDUSTRY

(IN $)

	ALL	CONSUM MFG	INDUS MFG	BANK	FINAN	EDP SERV	OTHER SERV
CORPORATE STAFF							
Vice President	56,519	63,750	54,375	53,125	57,091	54,482	60,800
Director of Dp/MIS	44,647	44,293	46,599	39,134	53,273	45,385	48,857
Services Coordination/User Liaison Dir.	35,406	27,000	40,256	37,000	41,500	36,711	67,500
Information Center Director	41,960	33,500	43,494	34,405	46,200	44,755	52,000
Director of Security	34,334	NA	40,944	45,000	37,500	31,800	44,000
SYSTEMS ANALYSIS							
Manager	40,312	40,625	39,068	25,000	36,000	44,900	43,167
Senior Systems Analyst	34,910	33,654	35,180	37,509	32,000	36,597	36,700
Lead Systems Analyst	32,775	26,000	38,431	43,980	21,586	30,857	41,500
Systems Analyst	28,730	28,200	31,090	36,386	30,000	27,922	29,540
Junior Systems Analyst	25,121	16,500	23,616	22,002	28,000	23,000	25,800
APPLICATIONS PROGRAMMING							
Manager	39,889	42,667	41,848	27,000	35,750	42,900	43,460
Lead Application Programmer	32,420	31,071	38,389	24,500	34,000	34,001	37,800
Senior Application Programmer	28,730	27,352	30,140	32,505	28,500	27,320	33,700
Application Programmer	23,218	23,488	24,068	19,667	22,864	24,682	24,575
Intermediate Application Programmer	22,597	23,258	24,663	20,920	18,067	22,170	21,375
Junior Application Programmer	19,498	17,750	20,809	17,483	17,650	19,754	22,375
SYSTEMS ANALYSIS/PROGRAMMING							
Manager	39,820	37,816	39,615	49,028	39,834	43,606	45,682
Lead Systems Analyst/Programmer	34,891	35,165	32,254	42,829	34,000	38,750	35,416
Senior Systems Analyst/Programmer	31,523	30,439	30,655	23,755	32,588	34,051	32,865
Systems Analyst/Programmer	26,856	27,383	26,968	25,500	25,760	27,997	27,369
Intermed. Systems Analyst/Programmer	24,201	24,412	23,301	23,333	25,000	26,539	22,667
Junior Systems Analyst/Programmer	20,602	19,283	21,054	21,000	21,750	21,433	21,093
OPERATING SYSTEMS PROGRAMMING							
Manager	40,109	40,243	40,040	37,825	40,869	45,685	47,650
Senior Systems Programmer	35,416	35,600	36,003	33,893	34,600	39,680	41,171
Intermediate Systems Programmer	28,397	27,000	28,756	32,964	25,300	30,431	31,763
Junior Systems Programmer	21,687	19,100	24,719	NA	23,607	27,550	24,533
DATABASE ADMINISTRATION							
Manager	38,825	38,000	38,921	41,003	38,000	43,110	40,000
Database Administrator	31,827	32,333	32,849	37,290	29,850	34,894	32,500
DATACOM/TELECOM							
Manager	42,322	NA	47,611	47,748	47,670	37,467	75,000
Analyst	28,307	28,375	33,312	22,446	33,434	26,383	45,000
COMPUTER OPERATIONS							
Manager	30,364	32,191	32,401	26,590	32,857	34,504	31,529
Shift Supervisor	23,580	25,456	27,274	17,590	22,866	23,591	26,350
Lead Computer Operator	19,326	18,256	20,505	15,683	19,587	18,783	20,781
Computer Operator	15,960	15,601	15,647	12,657	19,286	17,256	15,459
Magnetic Media Librarian	17,115	22,125	15,808	11,000	15,121	14,325	18,888
PRODUCTION AND I/O CONTROL							
Supervisor	24,872	24,313	23,303	21,956	23,300	27,006	25,000
Lead Production Controller	20,134	22,500	20,850	NA	16,500	24,683	18,500
Scheduler	20,134	20,313	17,767	21,465	18,333	20,000	19,600
Control Clerk	16,611	16,798	13,813	14,058	14,420	15,662	13,250
DATA ENTRY							
Supervisor	17,606	18,900	18,444	12,855	17,231	16,934	18,400
Operator	14,374	13,948	14,287	10,870	12,701	12,990	13,386
OFFICE AUTOMATION							
Word Processing Supervisor	19,478	16,000	16,933	16,835	18,250	22,833	18,036
Word Processing Operator	14,592	13,900	14,200	12,767	13,738	15,287	16,000
Micro. User Services Specialist	23,135	21,000	24,175	11,440	32,500	21,312	NA
Documentation Specialists	20,691	16,333	18,250	21,118	21,025	23,405	19,599

NA: not available

					ANNUAL SPENDING	
DISTRB	GOV'T	MED/ LEGAL	TRANS/ UTIL	EDUCA	< $1M	> $1M
49,833	60,000	47,667	85,000	52,000	51,272	66,089
42,079	41,656	46,703	45,600	40,101	39,779	54,144
38,000	42,072	20,000	NA	29,417	32,436	38,933
35,900	41,877	41,333	NA	36,950	35,047	45,416
30,000	31,949	NA	NA	NA	33,333	34,565
35,063	41,631	35,256	NA	34,500	37,409	44,416
27,250	37,215	34,200	31,611	30,550	33,925	36,388
28,500	34,511	34,000	32,600	23,667	32,504	33,452
28,500	28,045	32,800	32,000	24,328	27,768	29,828
20,175	28,589	30,600	23,400	18,250	22,905	27,593
30,887	40,120	44,600	31,130	37,553	34,659	42,839
26,000	33,635	32,578	NA	28,311	30,793	33,784
23,833	30,841	27,960	21,400	27,698	27,489	30,023
21,000	25,714	21,954	21,887	20,815	22,369	24,455
19,200	24,394	27,333	21,000	19,881	21,063	23,701
18,177	19,615	13,814	19,450	17,121	18,530	20,963
36,778	39,057	36,570	38,757	36,037	34,696	44,498
28,000	36,440	33,809	38,250	29,997	31,728	37,593
31,313	31,247	31,840	33,167	29,076	29,598	33,443
28,294	27,983	26,833	27,309	24,400	25,681	28,479
19,200	26,345	24,398	25,900	23,821	22,617	25,666
22,883	21,509	17,750	22,450	19,420	19,569	21,539
33,980	40,752	39,372	38,045	34,760	34,480	42,298
30,600	38,144	33,967	32,267	31,516	34,627	35,822
29,000	30,725	30,000	29,168	23,853	26,348	29,335
20,000	20,812	23,708	18,500	20,044	20,822	22,279
36,300	35,927	39,500	NA	36,633	33,700	40,608
29,333	27,445	30,447	35,500	27,167	28,764	31,943
25,000	39,375	33,000	NA	35,819	30,767	42,602
19,667	29,668	31,000	NA	22,837	24,750	28,329
28,004	29,757	28,867	30,046	27,683	27,219	33,858
20,231	27,034	24,174	NA	20,396	20,535	24,853
18,762	20,708	19,599	25,052	18,288	18,224	20,684
15,109	17,407	15,902	18,665	15,572	15,412	16,976
14,000	16,075	20,000	13,500	16,151	20,027	16,512
19,728	30,744	24,840	23,000	24,672	22,210	26,417
13,333	20,935	20,667	NA	19,866	18,677	20,893
NA	19,857	18,837	24,400	18,945	17,000	20,616
12,203	17,242	17,014	17,996	15,986	15,941	17,086
16,650	17,123	17,582	22,733	19,681	16,624	18,842
15,401	14,621	13,461	16,689	14,134	14,004	15,269
16,500	18,344	21,100	NA	19,484	18,148	21,091
12,163	15,393	17,887	16,700	13,070	14,275	15,162
16,500	25,980	17,000	33,970	19,342	22,712	23,364
12,500	19,731	16,532	15,550	26,488	19,558	21,543

Users have to put together their own networks by writing software and choosing hardware, and have to manage those networks from terminal to front-end processor to mainframe. In fact, some former AT&T engineers and managers have been welcomed into the user community, which needs their expertise more than ever.

Another area in which expertise is rare but demand growing is so-called artificial intelligence, which calls for special programming skills that are only now becoming available in number. While there isn't a great deal of AI work going on in corporations, interest is beginning to blossom and so-called "knowledge engineers" are finding their services needed by organizations that hope to capture a human expert's special knowledge and "clone" it in what are known as knowledge-based systems. Bernstein says she has seen some demand for this type of person from insurance companies, banks, and other financial institutions.

PERKS IMPORTANT AS EVER

Perquisites are as important as ever to dpers, the most common ones being medical coverage and paid vacations, followed by disability and life insurance and pensions. Stock options, profit sharing, and automobiles, three other popular perks, are offered more to management than to staff, as might be expected. In many cases, perks are used judiciously to lure candidates into a company and then keep them there for as long as possible. Despite the limitations of the economy, the shift of personnel from company to company continues, with the brighter lights seeking their fortune wherever it takes them.

While in past surveys the strongest turnover rates were experienced in Sunbelt cities, where general economic health was often better than in the Northeast and on the West Coast, this year the strongest rates were found in other areas. For instance, the turnover rate in Manhattan was 24.8% and in Detroit 14.1%. At the low end of the turnover spectrum were Philadelphia at 5.3% and Cleveland at 4.7%.

Some analysts predict that the dp hiring picture will get better in the second half of the year. The CompuSearch division of Management Recruiters International Inc., Cleveland, found that just over two fifths of the several hundred companies it surveyed earlier this year would increase their staffs by the end of the year, up a few points from the number recorded in late 1984 for the year's first half. Only 7% of those surveyed by CompuSearch indicated a decrease of staff for 1985.

A survey taken last year by the As-

FIG. 5

AVERAGE SALARY BY REGION

(IN $)

TITLE	ALL	BOSTON	MANHAT	NYC AREA	PHILA	WASH/ BALT	ATLANTA
CORPORATE STAFF							
Vice President	56,519	58,929	95,000	61,875	44,000	61,240	55,819
Director of Dp/MIS	44,647	43,625	57,750	46,345	41,638	48,093	42,388
Services Coord./User Liaison Dir.	35,406	26,667	NA	38,500	27,000	52,262	30,000
Information Center Director	41,960	39,000	NA	40,500	NA	49,066	31,500
Director of Security	34,334	30,000	NA	NA	NA	NA	NA
SYSTEMS ANALYSIS							
Manager	40,312	41,286	35,000	42,305	33,250	36,063	39,833
Senior Systems Analyst	34,910	30,250	NA	37,973	28,000	36,750	34,333
Lead Systems Analyst	32,775	22,000	NA	43,500	29,500	41,000	32,167
Systems Analyst	28,730	30,500	NA	32,286	26,333	28,125	28,500
Junior Systems Analyst	25,121	NA	NA	25,000	22,000	24,000	23,667
APPLICATIONS PROGRAMMING							
Manager	39,889	36,950	NA	44,900	26,750	39,000	41,767
Lead Application Programmer	32,420	29,879	NA	30,429	38,000	35,333	31,194
Senior Application Programmer	28,730	27,500	NA	28,918	28,667	28,267	25,840
Application Programmer	23,218	21,033	NA	24,239	23,076	23,107	22,500
Intermed. Application Programmer	22,597	20,175	NA	22,823	NA	23,500	24,333
Junior Application Programmer	19,498	17,720	NA	17,500	20,750	17,643	18,763
SYSTEMS ANALYSIS/PROGRAMMING							
Manager	39,820	43,200	45,000	40,583	41,468	37,289	38,200
Lead Systems Analyst/Programmer	34,891	34,600	NA	39,200	32,497	34,363	31,400
Senior Syst. Analyst/Programmer	31,523	28,100	34,667	32,347	32,080	28,742	30,060
Systems Analyst/Programmer	26,856	31,079	28,000	25,514	29,994	26,333	27,750
Intermed. Systems Analyst/Program.	24,201	26,833	NA	25,713	25,120	25,625	30,000
Junior Systems Analyst/Program.	20,602	21,857	NA	22,384	22,600	17,000	20,750
OPERATING SYSTEMS PROGRAMMING							
Manager	40,109	39,833	50,000	44,367	32,475	42,636	40,600
Senior Systems Programmer	35,416	36,120	NA	42,044	30,550	36,683	33,429
Intermediate Systems Programmer	28,397	27,000	27,000	31,798	26,500	29,040	29,080
Junior Systems Programmer	21,687	24,767	NA	29,600	NA	NA	24,160
DATABASE ADMINISTRATION							
Manager	38,825	NA	NA	42,483	NA	39,715	35,875
Database Administrator	31,827	42,051	NA	40,750	44,000	28,500	30,540
DATACOM/TELECOM							
Manager	42,322	NA	NA	41,223	70,000	38,754	40,000
Analyst	28,307	32,500	NA	27,905	34,500	30,000	31,025
COMPUTER OPERATIONS							
Manager	30,364	33,608	31,467	34,738	27,364	31,438	25,171
Shift Supervisor	23,580	24,010	23,750	24,360	20,000	30,592	19,167
Lead Computer Operator	19,326	20,267	22,000	21,383	18,571	18,986	17,330
Computer Operator	15,960	16,842	19,000	17,136	14,310	16,220	14,511
Magnetic Media Librarian	17,115	15,500	20,000	21,026	NA	18,000	12,000
PRODUCTION AND I/O CONTROL							
Supervisor	24,872	21,413	30,000	22,657	17,500	36,815	23,500
Lead Production Controller	20,134	25,000	NA	16,650	NA	25,810	15,000
Scheduler	20,134	15,250	NA	25,800	NA	26,381	12,950
Control Clerk	16,611	16,899	20,000	16,409	15,311	18,652	13,698
DATA ENTRY							
Supervisor	17,606	19,200	NA	18,655	13,533	19,414	13,857
Operator	14,374	14,203	16,000	14,263	11,615	13,920	11,977
OFFICE AUTOMATION							
Word Processing Supervisor	19,478	NA	NA	24,200	17,500	19,979	25,000
Word Processing Operator	14,592	15,566	13,000	14,255	10,000	16,599	15,500
Micro. User Services Specialist	23,135	20,250	NA	20,110	27,000	33,286	20,000
Documentation Specialists	20,691	17,798	NA	22,167	20,000	23,474	16,725

DENVER	HOUS-TON	DALLAS	CHI	MINN/ ST. PL	CLEVE	CIN/ COL	DTRT	ST. LOU	SEATL	SAN FRAN	LOS ANGEL
52,000	NA	42,500	50,250	53,100	54,700	59,833	NA	36,000	54,875	66,831	59,524
48,143	44,685	51,227	47,286	36,842	47,400	49,448	43,420	42,657	41,763	51,672	48,206
18,000	67,500	NA	NA	46,000	50,688	NA	32,000	35,934	33,500	43,500	51,500
NA	NA	NA	38,333	NA	51,132	45,525	45,400	47,976	40,000	32,456	33,780
NA	NA	NA	NA	NA	45,000	NA	44,000	40,944	31,459	45,000	33,007
39,250	51,250	41,850	37,167	40,783	48,500	41,874	34,000	43,159	37,016	44,200	44,885
35,500	30,000	31,960	30,780	32,150	36,500	37,764	NA	33,436	34,966	37,375	39,686
NA	32,000	30,000	NA	33,667	36,500	29,240	18,172	35,443	34,444	32,333	45,000
30,000	26,750	26,333	27,367	31,167	28,000	28,067	30,500	30,343	25,424	31,000	30,064
20,500	NA	21,500	23,000	20,000	29,000	20,200	NA	29,332	27,000	27,000	23,500
39,667	46,300	36,825	49,650	42,000	NA	45,900	38,000	44,738	37,706	47,416	31,667
34,500	NA	31,217	33,571	36,475	29,000	39,910	NA	36,972	30,576	41,200	32,750
32,000	31,467	31,428	27,086	27,545	27,000	26,110	NA	30,672	28,576	39,077	32,919
25,820	27,100	25,000	26,461	20,663	22,096	21,133	21,300	22,054	22,597	28,912	25,068
27,000	NA	20,500	23,889	18,350	21,160	21,000	NA	26,463	22,445	30,673	22,914
16,800	19,200	20,167	19,714	19,500	17,500	16,833	NA	22,405	19,000	23,105	19,326
39,446	50,500	39,643	40,240	37,333	40,137	41,352	40,000	30,567	41,350	45,385	40,099
NA	50,400	35,000	38,000	NA	39,612	33,353	NA	22,250	32,042	40,409	40,033
33,300	34,200	31,200	35,750	34,200	33,187	29,023	26,075	25,500	31,310	38,800	38,960
25,875	33,163	27,333	25,500	26,083	27,487	24,617	22,875	26,000	25,963	29,194	30,587
33,000	24,500	24,000	24,333	21,150	23,139	20,417	NA	22,000	24,661	28,000	28,419
24,000	NA	20,000	19,167	NA	22,000	22,183	20,000	19,000	21,494	20,333	22,828
40,492	50,500	40,000	42,000	30,000	43,008	44,360	37,000	47,436	37,942	43,971	36,308
39,500	43,850	30,500	32,729	37,200	37,284	28,525	32,000	36,772	36,700	31,296	40,196
NA	36,300	30,000	27,620	23,200	26,142	26,507	26,500	33,780	25,257	30,457	33,802
22,912	22,600	NA	NA	NA	15,000	17,950	NA	19,173	18,000	27,420	29,600
36,000	NA	36,000	35,865	NA	40,000	45,910	40,000	35,222	39,600	32,000	43,986
39,500	NA	27,500	29,750	35,000	27,872	31,587	NA	30,312	33,600	22,000	33,000
NA	NA	NA	36,500	NA	46,150	44,910	NA	35,424	32,610	51,331	18,000
45,000	NA	NA	27,313	23,875	30,000	28,587	NA	28,560	23,949	25,470	30,333
30,800	26,000	28,120	33,933	33,028	34,400	33,450	26,700	24,321	31,845	29,810	31,617
NA	NA	20,175	23,661	26,500	27,521	34,320	16,025	26,346	27,408	26,000	22,510
20,257	18,550	18,083	20,437	21,630	19,690	19,421	19,250	16,525	20,388	20,147	21,561
16,074	18,794	16,238	14,891	16,557	14,477	15,582	16,363	14,083	16,404	15,948	17,843
NA	23,150	15,000	14,464	13,060	20,180	13,450	NA	15,506	14,117	NA	21,000
25,000	NA	16,000	24,310	24,950	35,000	25,000	NA	26,912	25,200	33,913	24,803
19,000	NA	NA	17,000	20,000	22,000	NA	NA	22,600	24,120	22,340	19,810
18,000	NA	17,333	18,150	21,000	25,000	23,900	NA	18,000	21,074	19,896	15,600
NA	NA	14,000	12,739	17,130	14,467	15,320	NA	15,100	13,675	17,937	16,290
18,000	NA	14,860	16,340	17,833	20,000	22,732	17,600	16,500	18,159	17,858	19,044
14,087	14,900	14,305	13,003	14,640	13,225	13,874	20,411	12,851	17,311	16,029	14,860
15,000	18,500	18,000	19,333	12,500	18,400	19,500	18,400	NA	19,133	26,304	22,250
14,186	21,600	12,500	13,508	9,000	13,503	14,775	13,333	11,667	15,937	18,883	17,720
NA	NA	14,000	16,500	NA	27,024	15,780	21,000	21,000	20,660	42,750	NA
23,250	22,000	14,250	22,000	NA	26,000	15,750	NA	13,000	19,287	30,073	23,994

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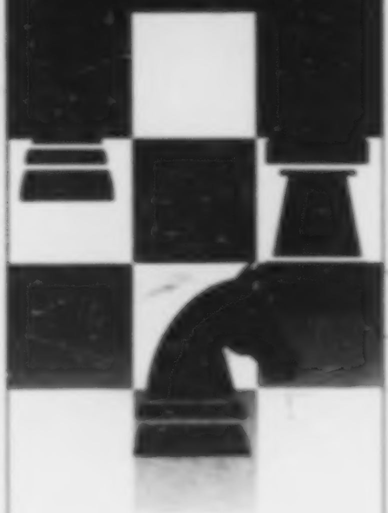

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JOB DESCRIPTION GUIDE

Respondents to the salary survey matched, as closely as possible, their staff categories to the following job descriptions.

Corporate staff: Reports to senior management within corporation.

Vice president: The senior executive for all corporate information systems. Responsible for long-range planning, budgeting, and operations.

Director of dp/MIS: In charge of all data processing atthe divisional or departmental level. Responsibilities parallel those of corporate officers, but may be at least partially guided by decisions made at corporate level.

Services coordinator/user liaison director: Works for dp department and end users. Represents users when operational problems occur.

Information center director: Manages activities of information center, including choice of computing tools, end-user training, and in-house consulting services.

Director of security: Oversees security measures taken to secure data, systems, and physical premises.

(For the seniority levels in each of the following categories, refer to the section on job levels.)

Systems analysis: Confers with users to define and formulate logical statements of business problems and devise procedures for solutions through use of dp systems.

Applications programming: Develops, designs, prepares computer programs.

Systems analysis/programming: Performs the functions of both the systems analysis and applications programming posts.

Operating systems programming: Programs, maintains, and introduces modifications to systems software.

Database administration: Plans, organizes, and schedules the activities of the database section. Establishes standards and maintains data dictionary.

Data communications/telecommunications: Designs and develops data communications networks and oversees installation and operation of same.

Computer operations: In charge of equipment, data entry, production control, and post processing, but not of systems analysis, applications programming, or other development functions.

Production and I/O control: Sets up and schedules jobs for processing so as to maximize utilizaton and meet turnaround requirements.

Data-entry: Performs data entry and verification functions.

Office automation: Operates word processing equipment, electronic typewriters, and terminals for text editing. Includes microcomputer specialists, as well.

Documentation specialist: Writes, maintains and distributes documentation for systems generated in-house and purchased from without.

JOB LEVELS

Manager: Advanced degree and minimum five years' experience or equivalent combinations. Strong management skills, performs personnel evaluations, budgeting, progress reporting, and project management.

Lead: Bachelor's degree or equivalent and minimum four years' experience in dp with two of those years in a supervisory capacity. Performs all levels of supervision, generally as a project manager.

Senior: Bachelor's degree or equivalent, and minimum three years' experience, including some supervision.

Intermediate: Bachelor's degree or equivalent and minimum two years' experience. Requires direction on some activities.

Junior: Two to four years of college and minimum six months' experience or equivalent combination. Requires direct supervision.

sociation for Computer Operations Managers, based in Garden Grove, Calif., found that salaries for that type of job were keeping pace with the traditionally higher-paid programming manager. Data entry, data control, and computer operations salaries "are beginning to equalize," says a spokesman for the organization, claiming that computer operations is losing its second-place ranking and is being recognized for its importance.

"The top operations person is now at a much higher level in the data processing management hierarchy than in the past, which is bolstering professional credibility for operations management," the spokesman says, noting that operations managers bring in average salaries of about $40,000. ◆

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THE R&D RACE

ALSO

PTTS PUSH FOR TOUCHY TARIFFS

ARE SMART BUILDINGS A DUMB IDEA?

DATAMATION

OCTOBER 1, 1985/$3 U.S.A.
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FEATURES

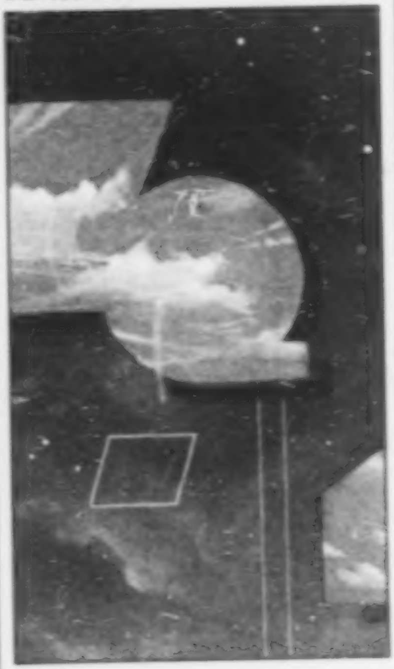
22
IN FOCUS

Willie Schatz tells the real story of the computer companies doing business in South Africa, and explains how President Reagan's order banning the sale of computers to some government agencies there will affect the dp industry in "South Africa: Pulling the Plug."

68
PUSHING THE STATE OF THE ART

A DATAMATION Staff Report

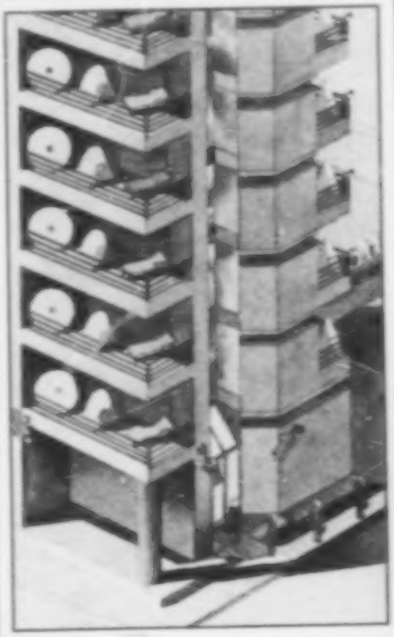
Even if the exotic fifth generation project never comes to pass, the Japanese drive for new computing technology has stirred many other nations to action. Since 1981, large computing R&D projects have been started by almost two dozen industrial countries.



89
A SYSTEM TO GROW WITH

David Livingston

A look at Federal Express's experience using a 4GL to develop a decision support system for corporate planning.



101
ARE SMART BUILDINGS A DUMB IDEA?

Leopold Froehlich

Property owners and developers hope the advent of shared tenant services will help them rent space. Equipment vendors hope to sell PBXs, computers, and sensors. Third-party firms hope to manage the smart services. The main thing they have in common is that none of them are making any money at it yet.

109
AVOIDING CONVERSION CONFUSION

Jerome A. Schulz

Some lessons to ease the conversion from DOS to MVS, the classic nothing-to-gain, everything-to-lose situation.

119
KEYFIELD DESIGN

Frank Sweet

Why do some users insist on embedding clusters of data into ID numbers? Join us as we uncover further secrets of database design in part four of a 14-part series.

NEWS IN PERSPECTIVE

32 **TELECOMMUNICATIONS**
The PTTs' touchy tariffs.

42 **SOFTWARE**
Building a better program.
Strength plus strength.

52 **MICROCOMPUTING**
HP shows an AT clone.

57 **BENCHMARKS**

DEPARTMENTS

9 **LOOK AHEAD**
15 **LETTERS**
19 **EDITORIAL**

125 **HARDWARE**
133 **SOFTWARE**
139 **PEOPLE**
145 **SOURCE DATA**
149 **READERS' FORUM**
152 **MARKETPLACE**
153 **SUBJECT INDEX**
156 **ADVERTISERS' INDEX**

INTERNATIONAL 64-1

-2 **ENTERING THE EASTERN ZONE**
-11 **RESEARCH WITHOUT FRONTIERS**
-19 **EUROPE'S SOFTWARE SCENE**

COVER ILLUSTRATION BY RICHARD BOBER

IN FOCUS

S. AFRICA: PULLING THE PLUG

U.S. sanctions on computer sales may do little more than open markets for other suppliers.

by Willie Schatz

Mid-September's presidential order banning U.S. computer sales to some of South Africa's apartheid government agencies was a political victory for the Reagan administration, a defeat for the Congress, a nonevent for the U.S. computer industry and the South African economy—and maybe the chance of a lifetime for computer firms in Europe and elsewhere.

The order, which at press time found Congress in a scramble to pass stronger legislation, has also brought computers and the dp industry's role in apartheid more sharply into focus. In South Africa, computerization has helped everything from banking to passport control—among the most hated of apartheid's control tools.

While the U.S. is doing more business in South Africa than any other country—it has 33% of the purchasing power, according to Rudi Bouwer, head of Siemens' South African computer division—it's not the only nation with a large financial stake in South Africa. British, West German, and Japanese companies among others also are established strongly there (see Fig. 1).

The fastest-growing computer exporters to South Africa are the Japanese. As Fig. 2 points out, Japanese firms have doubled new business sales in the region since 1982. But because Japanese computer companies have been extremely quiet about their exports to South Africa, Japanese involvement there has had little publicity. In one case involving Hitachi, quiet may be too genteel a term. Persetel, one of several computer companies within the giant South African Barlow Rand group, came from nowhere in 1980 to seventh last year in number of mainframe installations (see Fig. 3). It's the fastest-growing computer company in the country and also seventh in minicomputer installations, as shown in Fig. 4.

Persetel's hardware is made in Japan.

"I understand the machines come straight from Hitachi, and I am sure that Hitachi knows what is going on," says Derek House, major accounts consultant for ICL South Africa. "After all, many Persetel users and potential users, including government departments, have taken trips to Japan to see the Hitachi factories." Among the tourists were reps of Escom, South Africa's national electric utility.

When asked about its involvement with Persetel, an Hitachi spokesperson told DATAMATION, "We are not selling our computers directly to South Africa. We're not familiar with Persetel's activities in South Africa. Persetel is not one of our oem customers. At present, we have no business activities in South Africa. We also have no plans to start exporting computers directly to South Africa should American companies withdraw from that market."

After being confronted with statistics regarding Japanese exports to South Africa (see Fig. 5) and other evidence uncovered by DATAMATION, Hitachi reversed its position.

"Recently we learned we are shipping our computers to South Africa," a company spokesperson said in Tokyo. "We began to ship them there directly based on requests from BASF [the company's West German oem]. BASF asked us to ship directly there. Based on our contract with BASF, we provide computers according to their instructions. All our future sales depend on BASF."

Although the Japanese have been given the official designation "honorary whites" by South Africa, there is a growing suspicion among South African users that Japan will follow the U.S. and impose some sanctions. Its clear though that they are in no hurry to do so.

> **"ICL, for one, is going to do well out of this because of the stance of the British government."**

Of Japan's big three, only Hitachi admits doing business in South Africa. A Fujitsu spokesperson claims the company doesn't have any direct business in South Africa, but concedes that "we don't always know where our product is going through oem channels. Maybe some of our products are exported to South Africa through Siemens and ICL."

NEC says it has no business in South Africa, although, like every other computer company, it concedes it can't control what other companies do with NEC components. NEC also indicates that doing business in South Africa would jeopardize its sales in other African countries.

It will be a good deal more difficult for U.S. computer companies to continue exports to South Africa than it has been for Hitachi if the U.S Congress gets its bill passed. The sanctions contained in the Anti-Apartheid Act would prohibit

ILLUSTRATION BY ALEX ROMANOWSKI

FIG. 1

SOUTH AFRICA'S LEADING HARDWARE SUPPLIERS

($ MILLIONS*)

COUNTRY	1982	1983	1984
U.S.	168	171	185
U.K.	86	33	45
Japan	22	28	46
W. Germany	35	33	45
France	19	28	26
Italy	23	14	17

*Figures include cpu system, peripherals, parts, and service.
Source: John Aczel

FIG. 2

GROWTH IN NEW BUSINESS EXPORTS TO SOUTH AFRICA 1982–1984

Japan	100%
W. Germany	27
U.K.	5
U.S.	0

Figures include total sales growth minus portion of sales for parts, maintenance, and service.
Source: John Aczel

FIG. 3

SOUTH AFRICA'S MAINFRAME SCORECARD

COMPANY	1979	1980	1981	1982	1983
IBM	101	119	142	148	169
ICL	55	65	64	74	81
Burroughs	43	44	51	55	55
NCR	11	14	16	16	16
Sperry	17	19	21	24	27
CDC	14	15	13	12	13
Persetel	—	—	6	16	29
Other	—	—	2	3	4
TOTAL	**241**	**276**	**315**	**348**	**394**

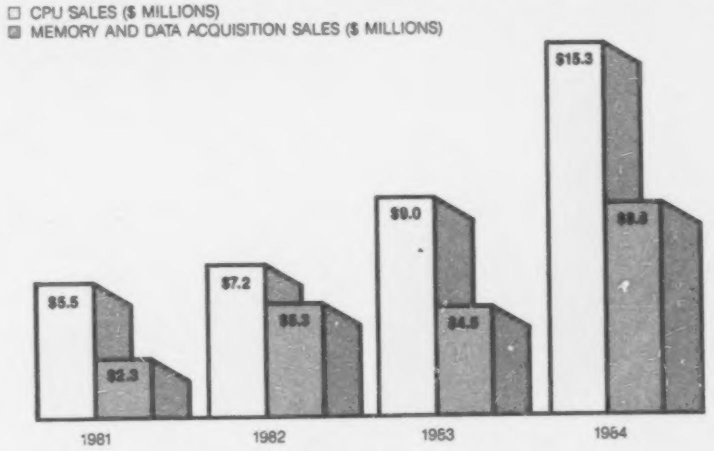
FIG. 4

SOUTH AFRICA'S MINICOMPUTER INSTALLATIONS

COMPANY	1979	1980	1981	1982	1983
IBM	88	107	116	116	112
ICL	79	112	149	166	168
Burroughs	53	79	90	93	91
NCR	25	45	55	65	97
Sperry	26	25	30	32	28
CDC	0	0	0	0	0
Persetel	0	0	0	0	0
Other	103	136	166	181	250
TOTAL	**374**	**504**	**606**	**653**	**746**

FIG. 5

JAPAN'S COMPUTER EXPORTS TO SOUTH AFRICA



the sale of U.S. computers, software, or goods, or technology intended to service computers, from being exported, directly or indirectly, to or for use by nine entities of the South African government. Those products may be exported to a governmental entity only if the services provided will benefit nonwhites or both whites and nonwhites, and a system of end-user verification is in effect to ensure the computers will not be used for any function of a proscribed agency. The restrictions apply only to exports with a contract value of $100,000 or greater. The restrictions may be waived by the Secretary of Commerce if it is determined that the computer sale to an entity serving whites only is for humanitarian purposes.

As tough as these sanctions are, they are significantly weaker than the original House bill, which would have banned all computer sales except to primary and secondary schools and fined corporate violators up to $1 million. Individuals would have gotten away with not more than $50,000 in fines, but they could have spent up to five years in jail. Those criminal penalties are retained in the compromise bill.

"I don't see this as being merely symbolic or counterproductive," says Sen. Frank Lautenberg (D-N.J.), the founder and former chief executive officer of ADP Corp. "Without the U.S. picking up the mantle of responsibility on moral leadership, we have nothing. I see us standing for morality and human rights by doing this. At some point you have to stand for something besides profits."

Faced with the real possibility of no new business in South Africa, U.S.-based computer companies marshaled their forces and lobbied strongly for the Senate's version of the antiapartheid bill, which was much milder. Principal among the U.S. computer lobbyists were Control Data, IBM, and Hewlett-Packard. These companies did their work so assiduously that Rep. Howard Berman (D-Calif.), the author of the computer ban, said he was "disturbed" by the computer companies' active lobbying.

"To be fair, these companies argued from the beginning that they did not wish to sell new computers to South Africa's military, police, or apartheid-enforcing agencies," Berman said on the House floor. "But they did want to continue to service and provide software for computers previously sold or leased to these agencies. They insisted on continuing to sell to other agencies of the South African government—even those which do not in any way benefit blacks.

"As far as I know, computer industry spokesmen were the only business representatives who mounted an active campaign against the sanctions in this bill. Their actions are surprising, given that their product contributes so directly to apartheid and sales to the South African government represent such a tiny fraction of their worldwide profits."

It's not just the government. Barely any of their South African business is visible on those and other companies' balance sheets. Hardware purveyors such as IBM, Sperry, CDC, and HP acknowledge that their South African operations account for less than 1% of their total revenues. That's $51 million for HP, $44 million for CDC, and about $450 million or so for IBM. The same percentage holds true for software companies such as Cullinet, Software AG, and Pansophic.

But while the $450 million or so that IBM generates doesn't weigh much on the global scale, it's a good deal of money in South Africa, where IBM is number one.

Since only one sixth of those dollars come from sales to the South African government, IBM and every other company doing business with the government will not be affected significantly on the revenue side.

"Sanctions would have no effect on what IBM is doing," says company spokesman Rich Coyle. "We don't sell to South African organizations that might use computers for repressive purposes. We would continue to be able to operate in South Africa."

Amen, say other companies. If they feel the sanctions all, it won't be more than a mosquito bite.

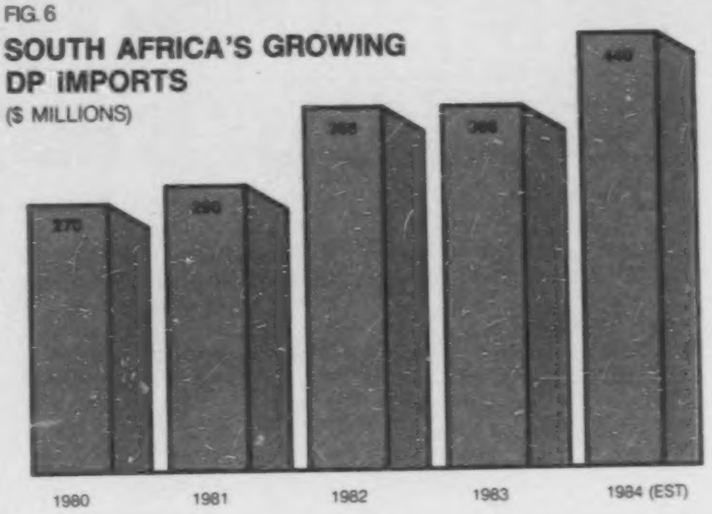
"It's been tough in the last few years," admits HP spokeswoman Barbara Kommer. "South Africa [operations] have been less profitable than the company as a whole."

South Africa may mine much of the world's gold, but it doesn't seem to be much of a gold mine for U.S. computer companies doing business there—despite a growing demand for imports of data processing equipment (see Fig. 6). According to CBEMA (the Computer and Business Equipment Manufacturers Association), U.S. computer exports to South Africa for the first half of 1985 were $67.8 million, down 24.9% from the same period in 1984. They had risen 7.9% from 1983 to 1984.

FIG. 6

SOUTH AFRICA'S GROWING DP IMPORTS

($ MILLIONS)



"These sanctions won't have a major impact," HP's Kommer continues. "They're not much different from the current Department of Commerce regulations on whom we can and can't sell to. They'll be marginally more restrictive."

Nevertheless, while these companies went to great lengths to convince Rep. Berman and others that they weren't doing business with the outlawed government agencies, there's considerable evidence indicating otherwise.

"More than any other single technological advancement, the computer has fostered the concentration of administrative power in the hands of South Africa's white elite," charges *Automating Apartheid*, a book written in 1982 by the National Action Research on the Military Industrial Complex group (NARMIC). NARMIC is part of the American Friends Service Committee, a Quaker organization working toward disarmament. The book continues, "Since the days of the first automated population register, computer use has spread to virtually every government department, playing a key role in Pretoria's ability to manage the African, Asian, and Indian populations.

"The IBM computer system used by the [South Africa] Department of Interior facilitates the very system of racial classification that undergirds apartheid. It also provides an efficient method of tracking South Africans' movements for security purposes."

FIG. 7

SOUTH AFRICA'S INFORMATION PROCESSING MARKET PROJECTIONS

($ MILLIONS*)

CATEGORY	1985	1990
Computer systems	342	634
Personal computers	94	288
Packaged software	63	261
Computer services	112	234
TOTAL	611	1,417

*Based on exchange rate of $0.45 per rand (Sept. 4, 1985)

The South African Defense Force (SADF), the country's army, is also apparently relying on IBM as a key supplier. NARMIC says that by the time regulations were issued in 1978 restricting direct sales of U.S.-made hardware to South Africa, IBM had supplied the SADF with a 360 at its Simonstown Naval Installation and was leasing out another 360 and two 370s.

NARMIC also says that there are two 370/158s with significantly upgraded capacity at the Centre for Computing Services (CCS) of the Council for Scientific and Industrial Research (CSIR, the South African weapons research organization, whose activities would fall under the Anti-Apartheid Act). According to Tom

Conrad, project director of NARMIC, CSIR and ARMSCOR are the backbone of South Africa's military establishment. Coyle says, "To the best of our knowledge, there is no IBM equipment at the South African Defense Force or the CSIR."

Both IBM and Control Data are cited as training CSIR personnel. Renowned for the social conscience of its founder, William Norris, CDC has apparently not practiced what Norris preaches. CDC has a Cyber 170/750, 17 peripheral processors, and 80 terminals at CCS. With the correct programming, the Cyber is capable of modeling nuclear explosions. Control Data declined to comment on the installation.

In 1980, CDC manufactured nine 9/80 disk drives that its British subsidiary supplied to ICL, which then incorporated them into the mainframe it supplied to South Africa's national police force. The U.S. Department of Commerce fined ICL and its South African subsidiary $15,000 for reexporting U.S. equipment to the military. CDC wasn't fined, but spokesman Dick Reid, interviewed by the *Twin Cities Reader* newspaper, agreed that "there was a problem in this case."

Not exactly Control Data's finest hour. Neither was the company's 1980 promotion of an Urban Planning Package software program among South African government employees. When the company learned that the marketing of the program had been reported at an international United Nations seminar on the arms embargo, it claimed that the package had been withdrawn from South Africa.

Asked to comment on these allegations, Control Data wouldn't. But it did issue the following statement: "The appropriateness of CDC's work in South Africa has not been altered by the recent unrest and accelerating friction. Though we have been greatly saddened by the violence and state of emergency, we are hopeful that the political reforms so desperately needed in South Africa will come from the renewed sense of urgency surrounding the South African situation.

"At CDC South Africa, we continue to serve the need for education and training in job development for black South Africans. This work has not been interrupted during the recent unrest and continues to be of critical importance to prepare black South Africans for equal participation in the economy of a South Africa that is free from the abhorrent apartheid system."

According to Congress, its sanctions are designed to hasten that day. Having fought its war in the House and Senate, the computer industry seems ready, although not necessarily willing, to accept the congressional version.

"The original House bill would have put everybody out of business," says Hugh Donaghue, CDC's vice president for international trade and government relations. "That's why we presented our views so strongly. Why do it to everybody? A lot of us are helping blacks through our programs.

"With no more sales or servicing or not even being allowed to sell spare parts, we all would have been out of business," Donaghue continues. "Then all you have is the British, French, and Japanese standing in the wings waiting to take over."

Well, not the French. At least, not officially. The government has announced a ban on new investment in South Africa—not another franc.

"All you do is stop the good things. I'm worried about the computer community."

Despite the current turmoil, the business of South Africa is still business. But the sanctions, no matter how symbolic, may be enough to make users and customers cast their eyes and wallets in other directions. Like east, for example. Or perhaps north, across the Mediterranean Sea. Britain and West Germany have already announced unequivocally that they won't apply sanctions. Japan hasn't revealed its position yet. The Japanese government has given no clear guidelines or instructions regarding direct shipments to South Africa.

So the Japanese, British, and West Germans may be rushing in where U.S. companies fear to—or aren't allowed to—tread.

"There are large users with installations of U.S equipment now running around looking for other suppliers that can provide long-term support," notes ICL's House. "ICL, for one, is going to do well out of this because of the stance of the British government."

"Many users are conscious that the U.S. companies may have a problem in the future," says John Miller, general manager of ICL computer sales in South Africa. "So far, however, there has been little follow-through effect resulting in changes of supplier. But there's a feeling that because European companies are not likely to be subject to sanctions that they are in some ways a more dependable source.

"There is a view that the lines of supply for Persetel are secure because the machines come via BASF in Germany," says Miller. "That is better than coming direct from Japan, because people feel the Japanese vendors may be coerced or encouraged to follow the U.S. lead with sanctions."

"The critical test is whether we can persuade our trading partners and allies to go along with us," says Sen. Lautenberg. "We've got to lean a hell of a lot heavier on Japan and our West European partners to participate more with us. We'll call the world's attention to who the good guys are and who they aren't."

When—or if—the U.S. leans, the Japanese may well fall in line. The Europeans, on the other hand, are not likely to follow the U.S. lead so readily, if at all.

The crisis in South Africa and the potential effects of U.S. sanctions have already dealt that nation's dp strength a heavy blow. Despite healthy projections for the South African information processing market during the period 1985 to 1990 (see Fig. 7), South African trade journals are full of stories about "the brain drain," as more and more qualified people are leaving the country to ply their trade in calmer waters.

"If dp people start leaving the country in large numbers, it is going to have a very bad effect on the local industry," says Peter Steyn, managing director of Computer Personnel Limited in Johannesburg and a committee member of the South Africa Computing Services Association. "Even in the good times, we have a 20% or 30% shortage of the right dp skills in South Africa, and when people leave, it will certainly aggravate what is already a bad situation."

"There's a very fine computer community in South Africa, most of which is antiapartheid," says Herb Grosch, former president of the Association of Computing Machinery and former director of the Institute for Computer Science and Technology at the National Bureau of Standards. "There's no way to make sanctions tight enough to hurt the military and police. All you do is stop the good things. I'm worried about the computer community. If the U.S. and Europeans turn their backs on it, the good things it can do will be cut away."

So will many of their supplies, which sanctions will make prohibitively expensive. For dp users in the land of the Cape of Good Hope, good hope may well be all they have left. ◉

Also contributing to this story were European managing editor Paul Tate in London, Tokyo bureau manager Thomas Murtha, and Gail Purvis in Johannesburg.

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Business with the bloc can pay off if high-tech traders are patient and play by the rules.

ENTERING THE EASTERN ZONE

by David Hebditch and Heikki Auvinen

For Western dp suppliers entering the Eastern Zone, money and patience are the rules of the road. The complex trade restrictions in the West coupled with the bureaucratic red tape in the East are roadblocks that must be overcome by high-tech companies hoping to do business with the Eastern Bloc.

That business could be very lucrative indeed. The Eastern Bloc is one of the world's largest untapped markets. The Eastern European appetite for dp wares, which has not been satisfied by local industry, has steadily increased over the years. Anxious to take advantage of that appetite for automation are the sales-hungry dp vendors in the West, who view the East as a mouth-watering business opportunity.

Selling to the Eastern Bloc, however, remains a politically sensitive subject. Western governments, fearing that any technology transferred to the East will end up in the hands of the Soviet military, have laid down a plethora of restrictions on dp trade. As a result, dp exports to the Eastern Bloc dropped dramatically last year (see Fig. 1).

The bleak export picture could brighten if the Paris-based Coordinating Committee for Multilateral Export Controls (Cocom) eases up on some of its strict trade regulations. There are in fact signs that Cocom is beginning to realize that some technologies just aren't that strategic anymore. In its last review in 1984, Cocom deregulated 8-bit micros, Digital Equipment PDP-11 minis, and other systems. A review of telecommunications equipment is due in 1988.

Technology, which has become a measure of industrial might, is also turning into a powerful force for achieving international détente. The recent rash of high-tech trading with China is a good case in point. Cocom watchers also predict that the deregulation drive will pick up steam as technology advances ever onward. That means that more and more dp wares could be wiped off Cocom's strategic technologies list.

In the meantime, the dp door to the East opens up only limited opportunities to suppliers of Western wares. East Bloc dp planning is generally based upon the use of computers that are compatible with popular Western models. In the mainframe field, the Ryad series is basically compatible with the IBM 370 range of about five years ago. The Soviets, along with their Eastern Bloc allies in the Council for Mutual Economic Assistance, claim they are making enough of these mainframes to meet their needs.

In the minicomputer realm, the PDP-11 has long been the mainstay of the Eastern Bloc's mini line. The local version of this machine is the SM minicomputer, which has a reputation for being slow and unreliable. Consequently, there's a healthy demand for PDP-11 add-ons and add-ins, as well as for the mini itself. An increasing number of PDP-11s were shipped to such countries as Hungary, Poland, and Czechoslovakia last year after the Cocom embargo was eased.

The Eastern Bloc countries have been slow in developing their own 32-bit minicomputer, dubbed the SM-1400. Early versions of this VAX look-alike have recently been on display at trade shows in Eastern Europe. If the system's internal buses and instruction set are compatible with the VAX, then a new market for licensable add-ons, add-ins, and software could emerge. Production shortages also will probably ensure demand for complete system imports, but licenses will still be tough to get for some time.

MOVES ON THE MICRO FRONT

At the lower end, the Soviet Union in 1983 began limited production of the Agate micro, an Apple II look-alike. Recent developments suggest that the Agate will not be the jewel in the Soviet desktop computing crown. The Russians also made more moves on the micro front last summer when they awarded Japan's Nippon Gakki Co. a $1.2 million (Y300 million) contract for 4,000 Yamaha VIS 503 Mark-88 pcs that will be used in Soviet schools and colleges. Japanese printer maker Star Micronics will package the 8-bit MSX-based micros with its own peripherals, including the Gemini 10X printers.

Star hopes to eventually ship another 100,000 pcs to the Soviets, who are planning to install more than 1 million micros in schools throughout the nation by 1990. The country's computer literacy campaign is an essential element in the Soviet's modernization program.

One area that definitely needs modernization in Eastern Bloc countries is telecommunications. That's not likely to happen very soon, however, since Cocom has already extended the embargo to cover stored program control (SPC) telephone exchanges and local area networks. This doesn't leave Western suppliers with very many telecommunications opportunities, unless they have stockpiles of older switch-

PHOTOGRAPH BY STEVE COOPER

The Agate micro will not be the jewel in the Soviet desktop computing crown.

es that they want to get rid of.

The sales outlook in the mainframe sector also is not very favorable. Prospects are much better in the mini and micro fields. In fact, Sord Computer got the okay from Cocom in August to export eight 16-bit pcs to Poland. The Japanese company is negotiating similar pc pacts with Albania, Bulgaria, and Hungary.

Special peripherals and software represent another sales opportunity for dp suppliers wanting to do business with the Eastern Bloc. In terms of applications, office automation is out, while manufacturing, CAD, and process control systems are in. Eastern Bloc nations still consider office automation and word processing to be "soft" technology applications.

Once a supplier has picked the product to be peddled in the East, then comes the tricky task of actually getting the business. East Bloc trading specialist Barry Martin of CC Travel in London advises companies to "get the tail to wag the dog." That tail is the end user. "Deal as much as possible with customers and get them to to put pressure on the foreign trade organization [FTO]. All you do," he says, "should be geared to cultivating end users."

An FTO gets involved in the sales process at a certain stage. In the USSR, the most massive Eastern Bloc market, FTOs are government bodies that operate under the direction of the Ministry of Foreign Trade. The FTOs that oversee dp trade are the Technopromimport, which handles industrial technology; the Mashpriborintorg, which covers machine tools; the Techmashimport, which deals with various technical systems; and the Electronorgtekhnika, which is in charge of computers and electronics. Familiarly known as Elorg, this is the most important FTO for dp traders.

The FTOs in the Soviet Union are good at tying up would-be sellers in an endless stream of bureaucratic red tape. East-West traders recount horror stories about how they had to spend hours fruitlessly waiting in FTO offices. Sometimes the process can be speeded up through early visits with Soviet Chamber of Commerce officials who work at the local embassy.

In the end, the most effective sales approach is to make direct contact with end users (see box). This is easier said than done. While most computer specialists in the USSR avidly follow the major developments in the worldwide data processing industry, the average Soviet end user may not know how to obtain Western wares.

The most common way to get in touch with end users is through seminars, symposia, or exhibitions that are held at

FIG. 1

HARDWARE* EXPORTS TO THE EASTERN BLOC

COUNTRY	U.S.S.R. 1982	U.S.S.R. 1983	U.S.S.R. 1984	OTHER EASTERN BLOC COUNTRIES 1982	OTHER EASTERN BLOC COUNTRIES 1983	OTHER EASTERN BLOC COUNTRIES 1984
	(IN $M)			(IN $M)		
Austria	4.0	6.6	3.3	10.0	11.3	15.8
Finland	8.4	18.0	6.7	0.6	2.2	0.06
France	10.2	11.9	4.1	6.5	4.9	6.7
West Germany	8.2	7.8	11.4	12.8	8.2	11.3
Italy	3.7	1.3	2.5	1.9	1.3	0.9
Japan	4.3	4.2	1.6	2.2	12.1	1.9
Norway	5.1	4.1	1.3	1.0	0.4	0.1
U.K.	19.8	9.5	2.8	11.5	10.9	10.0
U.S.	2.6	0.09	1.0	8.0	7.0	6.2
TOTAL:	**66.3**	**63.5**	**34.7**	**54.5**	**58.3**	**53.0**

Compiled by John Aczel

*Includes complete systems, cpus, peripherals, spare parts, and accessories.

REACHING EASTERN END USERS

The most effective way to get in touch with end users in the Eastern Bloc is through trade shows or seminars. But beware: both approaches can be expensive and time-consuming. Adding up all the charges for such things as travel, accommodations, and shipping, an average stand at an Eastern Bloc exhibition costs around $20,000.

High-tech traders who want something even more expensive and prestigious can go to the Mezhdunarodnaya, a modern complex of hotels and offices that offers facilities for exhibitions, seminars, and conferences. The Mezh, as it is familiarly known, is run by the Sovin-Center, which can put together a complete package for a private show.

One-company shows can also be arranged by the U.S.-USSR Trade & Economic Council, universally known as ASTEC because of its telex answerback code. The council has offices opposite the wedding cake-style Ukraina Hotel on Kutuzovsky Prospekt in Moscow.

Both the Sovin-Center and ASTEC can provide seminars, small exhibitions, lunch buffets, or evening receptions. Good crowds are almost guaranteed, since these foreign trade specialists send out invitations to end users and the appropriate foreign trade organizations (FTOs) that are involved in all Soviet sales. Vendors that sign up for these shows and seminars should come prepared to hand out plenty of freebies like pens and lighters. More important, they should have lots of technical and sales brochures in Russian.

While Soviet hardware engineers are pretty adept at converting displays and printers to the Cyrillic character set, a company would be wise to do these modifications itself, particularly on the equipment it plans to demonstrate. The Soviets will probably interpret such moves as a sign of a vendor's serious desire to serve local customers. Those local customers will be impressed and flattered, especially since an invitation to any type of trade show is still considered a privilege by most Russian end users. After attending the show, these users must file a report with their firms and with the FTOs.

Sometimes the State Committee for Science & Technolgy will organize a special event for a company that has a particularly innovative product. This rarely happens, so firms that feel they have something unique may want to propose an article on their wares to a local technical journal. Over 33,000 technical journals are published in the Soviet Union each month. These publications also provide companies with a low-cost advertising channel. High-tech traders should also develop their own lists of companies and institutes in the USSR to which they can send mailings.

—D.H.

“Tell the Russians we’ll take 100,000 balalaikas if they make up the value in fur coats and caviar.”

regular intervals in the Soviet Union.

A contact made during one of these exhibitions or seminars frequently leads to a request for more information. If this information is of genuine interest, then negotiations over the technical details usually begin. These talks can take anywhere from a few months to several years. Indeed, first-time computer sales can take as long as three years to be finalized in the Soviet Union.

The technical discussions concern the system configuration and other more mundane matters such as computer room layout, cabling, and air conditioning. The end-user organization needs all the technical details to get the proposed system included in procurement plans for the following year. This is the way the Soviet planning system works.

Luckier end users may already have been granted funds that are not tied to a specific purchase agreement. Some end users may also turn up at a trade show with “exhibition money” burning a hole in their pockets. The resulting negotiations can be conducted quickly and the deal can be closed rapidly if a supplier immediately applies for an export license.

BOGGED DOWN BY RED TAPE

Such fortuitous sales situations, however, are few and far between. That means that, in most cases, Western traders usually end up getting bogged down in the bureaucratic process. When the technical talks with the end user are over, the proposal is submitted to the appropriate FTO, which begins to haggle over the price. FTOs expect to pay around 125% of the list price in the West. So if a supplier starts by quoting a price set at 150%, the FTO will knock off the 25% difference and everybody’s happy. The FTO also works with the foreign supplier to establish payment terms and delivery schedules.

When a deal has finally been struck between the vendor and the FTO, an export license can be applied for. A license is granted by the trade authority in the country that exports the goods. If the hardware was originally manufactured in the States or is of American origin, then a supplier must also get a reexport license from the U.S. government.

The rules on granting export licenses established by Cocom are subsequently embodied in national legislation. All export applications are reviewed on the basis of two main Cocom criteria—the sophistication of the technology and its potential end use in the USSR. Any agreement made with a Soviet customer should therefore include specific mention of export licensing matters. This should cover a supplier when it comes to a license delay or denial. In the U.S., for example, it can take one to 12 months to process an export license application.

Special training provisions are also always included in dp sales contracts with the Soviet Union because suppliers simply cannot support end users in the same direct way that they can in the West. The training, whether for hardware or software, can be conducted in the USSR if a similar installation exists. Otherwise, it’s best to go abroad, which means that the Soviet trainees must get visas, a process that could take several months.

PREPARE WELL IN ADVANCE

Preparations for both training and installation must be made well in advance. An early survey of the installation site is a good move, since any necessary changes will take time. Also, if equipment modifications are needed, it’s best to make them prior to the final shipment. Delivery of that equipment or software is either direct to the Soviet Union or through an intermediary country such as Finland or Austria. It’s also worth noting that Soviet customs agents are less troublesome than their Western counterparts.

The sales agreement must also spell out the responsibilities of all parties involved with the installation and specify the procedures and criteria for accepting the system. Such things as visas, hotels, and travel all have to be worked out in advance. Visitor visas normally take two weeks to process, but the paperwork can be speeded up if the customer is directly involved.

Getting paid isn’t a major concern, since Eastern Bloc users tend to be good about settling their debts. Part of the contract can be invoiced when the exported wares have crossed the border. The remaining amount can then be paid when the system has finally been installed and accepted. In most of the data processing deals conducted via Finland, payments are made in convertible currency or in “clearing rubles.”

Invoicing and payments are made through the same facilities that are used in foreign trade in the West—letters of credit, banker’s transfers, and checks. The amount is usually paid in U.S. dollars, British pounds, or other hard currencies. But if it’s a big contract, a “counter purchasing” deal may be proposed by the FTO, which offers, say, 140,000 Russian balalaikas in return for a computer system.

What do you do with 140,000 balalaikas? First of all, you go to a special broker who, after researching the Western market for this type of musical instrument, comes back with a counteroffer that could go something like this: “Tell them we’ll take 100,000 balalaikas if they make up the rest of the value in fur coats and caviar.” That’s how Pepsi-Cola broke into the Soviet market—by agreeing to sell Russian vodka in the States. The U.S. probably got the best of that deal.

Once a dp pact is signed, the system needs to be supported. The warranty becomes effective when the system is formally accepted by the Soviet customer. Warranty periods range from six to 12 months, depending on the equipment. A word of warning: a standard warranty may not be acceptable.

A year after the warranty expires on a successful system, the end user is usually given money to upgrade and acquire spare parts, so strong after-sales support could result in long-term benefits. Eastern Bloc customers are also very loyal and follow-on sales to these users are much easier to negotiate and process.

Nevertheless, first-time sales are the hardest. In some cases, it may be better to go through a local company to get started. These firms, which usually get a 10% to 15% commission, will consider working for lower percentages if they are hired on a fixed retainer basis. This is actually a good way to make an initial foray with minimum risk.

High-tech traders evaluating those risks must also weigh the potential rewards of doing business in the Eastern Zone. Those rewards, however, can only be reaped by suppliers who are prepared to be patient and play by the rules promulgated by governments on both sides of the East-West fence. At the end of the day, it’s up to these vendors to decide whether it’s worth all the trouble and time it takes to see those red sales in the sunset.

British free-lance writer David Hebditch is a contributing editor to DATAMATION. Heikki Auvinen is the managing director of Asumer Oy, a Helsinki consulting firm that specializes in high-tech trade with the Soviet Union. Additional research for this article was done by Nick Anning.

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Vendors are trying to reposition themselves to take advantage of the changes in a mercurial market.

EUROPE'S SOFTWARE SCENE

by John Lamb

Software and services companies are taking center stage in the ever-evolving dp arena. Trying to take advantage of this pivotal position, European vendors began searching last year for new ways to capitalize on the constant changes in a mercurial market.

"We see increasing profits from a range of new activities," points out Doug Eyeions, director general of the European Computing Services Association (ECSA). "What's uppermost in our minds is the question of how to manage change and reposition ourselves in the market. Software houses have to become systems houses, bureaus must turn themselves into network services companies, and so on."

These transformations have been dictated by market trends. Some of these trends could be spotted last year in the European software/services sector, where revenues shot up 20% to around $13 billion. Software firms, swimming with the changing market tides, also saw a surge in sales of packages for pcs.

The clamor for networking wares and the growing popularity of open operating systems such as Unix also provided new marketing opportunities for Europe's software sellers. Hardware vendors also began courting these companies last year, encouraging them to develop software to exploit their machines.

There are good reasons for hardware vendors to pay homage to the software industry. "Increasing distribution costs per unit, which are largely due to falling hardware prices, force suppliers and manufacturers to seek new distribution channels," contends Wolfgang Stuerwhold, head of VDRZ, West Germany's services industry association. Computing services companies, he explains, are "increasingly recognized as suitable partners that can offer a complete hardware and software solution in addition to consultancy and training."

Whether the independent companies producing that software are leading the way or being led by the nose by hardware suppliers is a different matter. Hardware vendors that are increasingly relying on these third parties to help them move their boxes are also getting more directly involved in the software business.

Take for example IBM, with its Information Network Services subsidiary that leads the field with European revenues of roughly $250 million in 1984. IBM, which hopes to expand that business significantly this year, has begun in the States to bundle software with its PC and has introduced its own mouse-style Top View program. These moves are strong evidence that the mighty company is expecting a lot of hard cash from the software market in the near future.

That market for personal computing software was an important source of revenues last year for firms in Europe and the U.S. Cashing in on the demand for pc software, however, hasn't been all that easy for some European software houses. Most of the packages sold with pcs are American. There are few best-selling programs produced on European soil.

The one exception has been Micro Focus in Britain. Micro Focus, which has built up a good reputation in microcomputer software, scored $16 million in sales last year. Many of those sales were made outside Europe, which put the U.K. company in the seventh place position on the list of leading software exporters.

Most European companies that haven't had the success of Micro Focus are more accustomed to winning six-figure contracts from large customers. As a result, they usually aren't able to service a volume market. Many of these firms also have captive customers among local government authorities or national agencies that have a penchant for awarding contracts for large custom projects. For example, Europe's largest indigenous services company, Finsiel of Italy, is closely tied to government-controlled interests, which makes much of its business automatic. The fastest grower on the European software/services scene, Finsiel pulled in $156 million last year (see Fig. 1).

HOLDING ON TO TRADITION

Even the independent European software companies are wary about breaking away from their traditional custom business. "We are very, very cautious," explains Jean Noel Gorge, marketing director of Cap Gemini Sogeti (CGS) in France. "We are not willing to compete with the VisiCorps of this world. We'd probably be better off buying one of those companies with cash if we wanted to go into microcomputer software. Hundreds of micros are muscling into organizations. The problem is that it is the users who buy them. The best approach for us is to be a commercial advisor—to run micro centers along the lines of IBM's information center."

Nevertheless, the large custom software houses in Europe realize they are missing out on the action in packaged products. And there was plenty of that action last year, according to the latest ECSA

While packaged software steams ahead, the smokestack sectors continue to decline.

FIG. 1

THE FASTEST MOVERS IN EUROPEAN SERVICES

RANK	COMPANY		1984 ERP. DP REVS. ($ MIL.)	% CHANGE IN AAC
1	Finsiel	Italy	156.0	43.2
2	Scicon	U.K.	142.1	41.4
3	Cap Gemini Sogeti	France	150.4	30.4
4	Thorn EMI	U.K.	242.7*	28.2
5	Ciel	France	145.9	12.0

*Includes some revenues from other activities.
Source: DATAMATION

FIG. 2

WESTERN EUROPEAN SOFTWARE AND SERVICES MARKET

	1984 MARKET VALUE ($ MIL.)	% SHARE
HARDWARE MANUFACTURERS		
Packaged Software	2,231	17
Custom Software/Consulting	560	4
Subtotal	2,791	22
SYSTEM HOUSES		
Packaged Software	615	5
Custom Software/Consulting	741	6
Subtotal	1,356	10
INDEPENDENT VENDORS		
Packaged Software	1,161	9
Custom Software/Consulting	2,382	18
Subtotal	3,543	27
TRAINING	566	4
FACILITIES MANAGEMENT	84	1
PROCESSING SERVICES		
Local Batch	1,526	12
Remote Problem Solving	1,380	11
Remote Autotransaction	1,705	13
Subtotal	4,611	36
TOTAL	12,951	100

Source: European Computing Services Association

survey, which reports that packaged software accounted for 31% of the European software/services market. To make the most of this bounty, some European software firms have set up special groups to find out which of their wares are suitable for packaging.

For instance, Scicon in the U.K. has formed its Sisco subsidiary that will scour the company for custom software that could be packaged to have an international appeal. Scicon's parent company, British Petroleum, may spend up to $125 million over the next five years to fund the operation.

Across the channel in France, CGS is also thinking along similar lines. The company has produced a set of commercial applications packages that come in the form of modules that are sold with source code to experienced users. Around 400 customers are already using the modules in France. CGS assembles the modules to a customer's specifications, supplying them without maintenance or other extras. "They have a 'Polaroid' effect, explains CGS marketing director Gorge. "We give customers the box and they come back to buy 'film' from us. We see an increased demand for this more industrialized approach, especially among low-end customers."

While packaged software steams ahead, the smokestack sectors of the software/services industry—remote and local batch processing and data entry—continue to decline. Nonetheless, processing services still account for 36% of European software/services revenues, according to ECSA (see Fig. 2).

NETWORK SERVICES OPENINGS

The dwindling sales on the batch processing and timesharing front are being offset by new marketing opportunities that have opened up in network services. Those opportunities are being taken advantage of in France, where Pierre Dellis, chief administrator of Syntec, the local services and trade association, reports that "in spite of the increased cost of transmission, network application software grew very strongly in 1984."

Meanwhile in Britain, the liberalization of value added networks (vans) dangles a tempting carrot in front of service companies anxious to win contracts from private organizations that are now able to set up their own nets without PTT involvement. That carrot, however, is still out of reach, since the U.K. government hasn't made up its mind about how the van licenses will be issued.

So far, ICL, through its services subsidiary Baric, is the only company in the U.K. that has started working on a network of any size. IBM, which would dearly love to become enmeshed in the U.K. network scene, was turned down on its bid to enter England's vanguard with British Telecom. The U.K. government felt the duo would dominate the value-added network business with their net, which wouldn't conform to open systems interconnection (OSI) standards.

In any case, IBM has promised to provide OSI gateways on its systems and networks.

IBM's would-be partnership with BT was part of a broader trend toward team-ups and takeovers that was very much in evidence last year. Denmark's Christian Rovsing was rescued by ITT, British consulting company EPS was snapped up by Thorn EMI, and also in the U.K. Systems Programmers was taken over by Systems Designers. Employees at French firms OSI,

"It's difficult for software companies to devote their resources to medium- and long-term development."

Sesa, TITN, Answare, and Syseca also found themselves with new bosses last year—this time government-controlled ones.

American companies were also on the acquisition trail in Europe last year. Fueled by General Motors, Electronic Data Systems has quickly established itself as a force to be reckoned with on the European services scene. EDS took over Unilever Computer Services, an offshoot of the giant conglomerate. Other U.S. firms that started to make their mark on the European software/services market included Dun & Bradstreet and its McCormack & Dodge subsidiary.

But the traffic is not all one way. French firms, which are among the leading software/services companies in Europe, can count on strong Stateside sales. CGS, which has the largest worldwide turnover of any European software company, gets 27% of its $206 million revenue from its U.S. subsidiary, DASD. Britain's Systems Designers also increased its American interests by acquiring Warrington Associates of Minneapolis.

Last year the European Economic Community (EEC) also played its part in trying to draw the local services industry into new business domains. The EEC's splashy Esprit effort and the more downbeat Multi-Annual Program have tried to encourage scores of European software firms to explore such fields as expert systems, computer aided manufacturing, and the complex realm of software engineering.

NOT TOO MANY TAKERS

There haven't been many takers. John Wells, managing director of Logica's Brussels office explains why: "It is very difficult for companies in the software business to devote their resources to medium- and long-term development. In that respect, I don't think that the [European Economic] Community programs help very much. The grants don't contribute greatly to basic work. They just cover our overheads. But you have to add in the cost of collaborating with a couple of other firms."

Nevertheless, there can be little doubt that Esprit and the other national artificial intelligence (AI) programs such as Alvey in the U.K. and Konzept in Germany help focus software firms on research and development. Logica, for example, has set up a $2.25 million AI research center in Cambridge, England. The company also claims that it has forged closer links with the academic community as a result of its AI activities.

This AI activity is all well and good, but Logica's Wells worries that the various state-funded research schemes are diverting scarce resources away from more workaday and commercial projects in fields like electronic mail, machine translation systems, and document delivery. "We are getting a lot fewer invitations to tender for programs outside Esprit," he comments.

The market for such AI products as expert systems is admittedly still minuscule. The combined U.S. and U.K. market for expert systems software amounted to only $21 million last year, according to research firm Ovum, which sees no bonanza coming from this fledgling field until the 1990s at the earliest.

"Real growth [in expert systems]," Ovum reports, "will be limited by the availability of knowledge engineers and the rates at which successful applications can be implemented."

The availability of people with the right qualifications is also a continuing headache for most computer services firms. The 20% growth in European software/services revenues in 1984 was accompanied by a 10% increase in employment in this sector.

Leading the field in employment was Belgium, which expanded its software/services payroll by 25%. Following close on Belgium's heels was the Netherlands, which boosted employment in the local software/services industry by 20%.

Most of these new hires were made on the marketing and sales side, where employment was up 16%. That employment trend is expected to continue this year, as companies gear up to cope with the new markets and new industry pressures. While 1984 could be classified as a year of transformation for many of Europe's software/services companies, 1985 will be a year that will test their mettle and show just how effective they've been in changing to meet the new challenges. ◆

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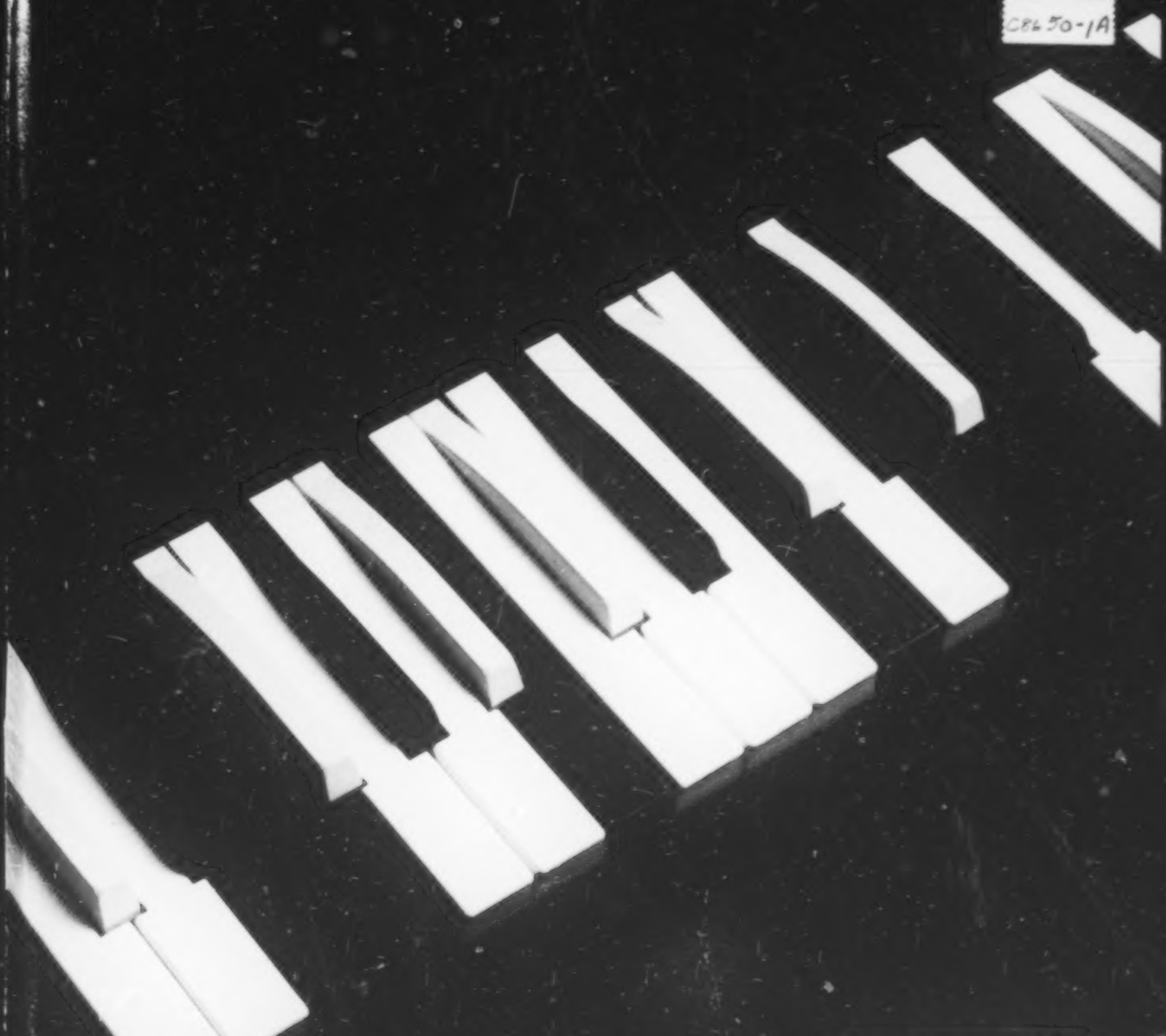

NETWORKING: YOU CAN'T PLAY WITHOUT STANDARDS

ALSO

HOW SECURE IS DES?

IBM'S SECRET DATABASE STRATEGY

DATAMATION

OCTOBER 15, 1985/$3 U.S.A.
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FEATURES

30
IN FOCUS

Charles L. Howe reports on "The State of State Telecom": 50 telecom managers in a new competitive environment must abandon good old boy bidding practices and choose among a bewildering variety of gear in a field where a mistake could cost a civil service rating or two.

84
TELECOMMUNICATIONS STANDARDS ARRIVE

Lawrence J. Bolick

Wise users now have an opportunity not only to solve nagging incompatibilities, but also to gain a competitive edge through increased efficiency and flexibility.

101
CAN WE TALK?

William Stallings

We can if we implement the transport protocol, which provides a reliable mechanism for the exchange of data between processes in our different computers.

110
DES REVISITED

Tom Athanasiou

The questions about encryption and privacy that have informed the DES debate are no closer to being resolved than they were when DES's traditional nemesis, "public-key" cryptography, first hit the journals.

119
TELECOM AND MIS: MANAGING THE MERGER

A Datamation Round Table

How are data processing professionals responding to the challenge? To find out, we asked three New York-area veterans of the telecom wars to stop by and discuss their experiences.

129
DO YOU TELECOMMUTE?

Margrethe H. Olson

You do if you were one of the 45% who responded to our survey in the affirmative. If you don't, maybe you were one of the 60.5% who said they'd like to. More, of course, within.

137
THE TWO-HEADED ARROW

Frank Sweet

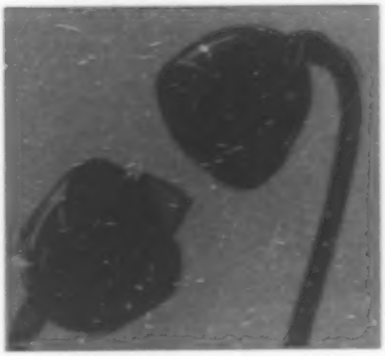
The fifth of 14 fascinating forays into the fundamentals of database design.

NEWS IN PERSPECTIVE

40 **SYSTEM SOFTWARE**
Calling all data.
42 **TELECOMMUNICATIONS**
Clipping SWIFT's wings.
46 **FACTORY AUTOMATION**
Closing the gap.
50 **APPLICATIONS SOFTWARE**
Looking for daylight.
56 **COMMUNICATIONS**
Network skirmish.
64 **SERVICE**
Training comes of age.
72 **BENCHMARKS**
79 **WORLD WATCH**

DEPARTMENTS

8 **LOOKING BACK**
13 **LOOK AHEAD**
18 **CALENDAR**
23 **LETTERS**
27 **HARDCOPY**



143 **HARDWARE**
149 **SOFTWARE**
154 **ON THE JOB**
156 **MARKETPLACE**
161 **READERS' FORUM**
168 **ADVERTISERS' INDEX**

SPECIAL REPORT 80-A

MANUFACTURING TECHNOLOGY '85: THE REAL COSTS OF AUTOMATION

OEM SUPPLEMENT 80-1

-2 **MINING THE AFTERMARKET**
-13 **COMPUTERS IN THE SCHOOLS**

COVER PHOTOGRAPH BY WALTER WICK

OEM EDITION

Sales of peripherals, supplies, and upgrades to existing customers represent up to 40% of revenues.

MINING THE AFTERMARKET

by Esther Surden

"It's a very big market opportunity for oems, and I don't know that we've done as good a job—or that our [resellers] have done as good a job—as we really should have. If handled correctly it can be a very profitable piece of the business—even 30% to 40% of an oem's or var's sales. It's an area you should be able to sell very easily and there should be good profit in it."

Richard A. Farwell, director of the Systems Supplier Program, Information Systems Division at Data General Corp., is talking about aftermarket sales—sales of peripherals, terminals, add-ons, supplies, and upgrades to existing customers. It's a business that minicomputer vendors and others are just beginning to address. And it's a business that vars and systems houses have been trying to find on their own, like prospectors looking for gold. For the most part, they like it just that way.

Says Terrell B. Jones, general manager of Dallas-based American Airlines Agency Datasystems, a Data General var: "We may be kind of unique but we don't use DG's sales force on the initial sale or on the follow-up, so they are not really involved in assisting us. We are out there on our own but that's our choice." Adds James Manion, vp of sales, Ask Computer Systems, Los Altos, Calif., "Hewlett-Packard either supports us or fights us for the same business." Steven Blackman, director of marketing, TEC Computer System, Newton, Mass., notes, "In the past, Digital Equipment Corp. tried to support our user base and sent out hundreds of pieces of information. Our clients asked us to get them off DEC's mailing list. It's too confusing."

Blackman points out that there are two segments to an aftermarket: 1) the sales of terminals and peripherals and additional software after the initial sale; and 2) the sale of a completely upgraded system. Like his colleagues at Ask and Agency Datasystems, the DEC var's marketing executive sees the creation of new applications or the evolution of existing applications for the customer base as an excellent way to drive aftermarket sales.

Those sales, according to a recent Yankee Group survey, are booming for oems and their vars. The Boston-based research organization surveyed 1,189 integrators, oems, and resellers last March and found that 34.2% of their customers came back for another system within two years of the initial sale; 36.7% bought more main memory; 44.6% bought additional workstations; 38.1%, more disk drives; 37.1%, additional printers; 25.8%, more modems; 23.6%, local area network hardware; and 65.5%, additional software (see Fig. 1). That software upgrades were the most popular repeat item didn't surprise the analysts: most vars address vertical niche markets ignored or left to them by vendors. Software is also the most lucrative aftermarket category, bringing in a 47.1% margin, according to those surveyed.

Just how profitable aftermarket sales are is largely a matter of how much effort is being put into follow-up and how much administration is needed. It's also a function of the length of time the equipment base has been installed and the number of systems an oem has in the field. Vars reported to Yankee Group that they made an average of 26.4% profit margin on cpus, 25.4% on local area networks, 26.9% on sales of disks, 25.6% on printers, and 25.8% on terminals.

The aftermarket is very important to American Airlines Agency Datasystems, for example, which has some 1,400 Data General cpus at travel agencies. Agency Datasystems' Jones cautions, however, that relying on this kind of business is a two-edged sword. Although upgrade business is good, he says, it takes a great deal of time: "In fact, I've recently had to tell some of our sales people to cool it a little bit on the upgrades and go back to doing initial sales.

KEEPING TRACK OF CUSTOMERS

"You have to keep very accurate records of what the customer has," Jones explains. "When a customer calls and says he'd like to add another terminal, you get into a lot of configuration issues. Does he have enough [multiplexed] lines? Does he have enough power left in the system to add another board if he needs to do that? Figuring out what he needs can take a lot of time." The effort pays off though, Jones adds. "It's profitable, there's no question that it's profitable, but I guess if I had to do it again—and we've been in this business 10 years—I wish we had a better set of extremely accurate records of what everybody had."

Agency Datasystems performed some 35 systems upgrades for customers last year and sold about 350 crts, 280 printers, 25 disk drives, and 12 tape drives to its already existing base, says Jones.

The Data General var handles field service dispatching for the manufacturer. Customers call Agency Datasystems, which refers maintenance to DG and then the var performs the billing for the oem, according to Jones.

"As the older systems become more expensive to maintain, they do an automatic selling job for us. We did a targeted mailing to customers that compared their cost of maintenance today with an upgraded system to show them that cost of ownership would actually go down," he says.

At Ask Computer Systems of Los Altos, Calif., add-on equipment sales make up about 20% of the company's total business. The firm currently distributes both Hewlett Packard and DEC equipment with its own manufacturing software, with HP equipment accounting for about 80% of the firm's 900 installations. "We have two programs to zero in on in this market," says Ask's Manion. "Product managers for the hardware take the information they get from the vendors and disseminate it to the sales force. In addition, we've put together a group of people we call installed base reps. If HP or DEC comes out with a new disk drive, we give the reps responsibility for getting that information out to our customer base and following up on it."

TEC Computer Systems, with 100 systems in the field, sees no need for a concentrated effort to contact its installed base, says Blackman. "We're a service company—not a hardware company—so we are in contact with our base all the time." TEC does sponsor a yearly users conference to

PHOTOGRAPH FROM THE BETTMANN ARCHIVE

Software is the most lucrative aftermarket category, bringing in a whopping 47.1% margin.

allow it to share information with its users, and distributes a quarterly newsletter that keeps users up-to-date on events, including the introduction of new DEC hardware.

For their part, the manufacturers are just beginning to address the aftermarket needs of their resellers, mainly in response to var clout. Sums up Wang director of var marketing Frank Girard, "As the var sales channel becomes a more significant part of our business, we find they want to be treated just like we treat our own sales people. Typically, we like to take the initiative, but in this case the resellers have been very active and vocal."

Vendors have come up with a variety of programs that attempt to meet var requirements in the aftermarket. DEC, for example, is pushing a program instituted in May called Fastship. According to Bruce Rollinson, group marketing manager for peripherals and supplies, DEC now sends out a menu of selected peripherals to vars and end users. If the item needed is on the Fastship menu, shipment takes place within 72 hours, and delivery is made directly to the var's customer.

"Before, vars had to actually inventory large quantities of peripherals, communications products, or memory products. Now, when they have emergency situations, they can call us for direct delivery of products on that menu," says Rollinson. Vars are given their normal corporate discounts, he notes, and the only limitation on the program is maximum order size. "In other words, they can't order 100 or 1,000 through Fastship, but they could order three. Rather than having to place a purchase order with DEC and wait for the normal flow of purchase orders to be processed, they can now just pick up the phone and get a quick delivery."

JONES OF AGENCY DATASYSTEMS: Preferring to look for its own gold mines, this American Airlines unit is out there in the aftermarket on its own by choice.

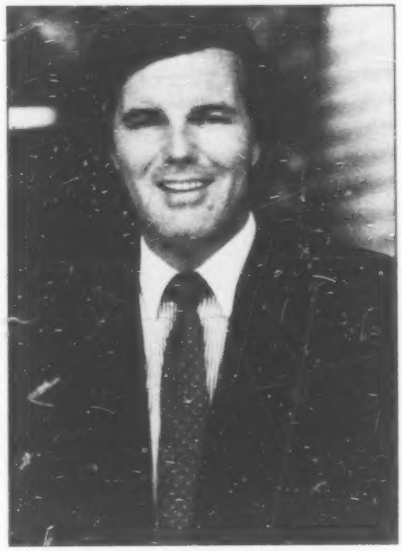
PLEASED WITH FASTSHIP

DEC var TEC Computer Systems has used Fastship since its introduction and generally is pleased with the benefits. "It's been helpful in allowing us to reduce inventory," says Blackman. "We used to have a couple of hundred thousand dollars worth of inventory that we don't have now. We use [Fastship] to accelerate the shipment of a system. We order the cpu and memory through ordinary channels and try to use the fast shipment program to get everything added to it."

But while DEC says it will ship within 72 hours, Blackman points out that an item doesn't necessarily get sent the fastest way. While the terminal might be placed on the truck within the stated time, it might not arrive at the customer's doorstep so quickly. And some crucial items aren't on the program, Blackman reports. If a customer wants to expand, for example, he might be able to get the backplane and cable, but his var might have to order the expansion box through ordinary channels—a silly situation in which things don't come together the way they should, he says. Skeptics suggest that the DEC Fastship program is just another way for the company to reduce crowded inventories.

Similarly, Data General has its DG Direct program and Wang its Wang Direct operation. DG Direct allows resellers to set up a blanket agreement for a certain volume of product, according to DG's Farwell. "A discount is applied based on the volume of product. The reseller works with the DG Direct organization to set up what is, in effect, a joint marketing program where customers can call the var for the products and services listed in the catalog," Farwell explains. Hardware offered through DG Direct includes the portable Data General One, Desktop systems, and Dasher terminals. Delivery is normally two to five days, says a DG spokeswoman.

Wang's independent sales organization has just been given a charter to participate in its aftermarket program. The company's Girard describes Wang Direct as a "very quick turnaround order mechanism for getting terminals and disk drives and items of that nature." Vars will be able to place orders over a hotline, from a catalog, or from other "mail pieces that promote certain items."


MANION OF ASK COMPUTER SYSTEMS: Special reps keep end users up-to-date on vendor equipment, generating sales of add-on gear.

One aggressive user of Wang's fast delivery marketing scheme is Informatics of Rockville, Md. In business since 1976, the legal system marketer has 250 installations and has instituted an active program to develop its aftermarket. Says Mary MacPherson, director of marketing at Informatics, "Right now aftermarket sales are about 50% of our business." Informatics has a telemarketing program set up in Phoenix and also uses direct sales for upgrades. "We try to get our customer used to dealing with a group assigned geographically but based in Phoenix."

Explains Patty Lane, one of Informatics telemarketing directors, the var can call in to a special phone number at Wang and "on the 4230 workstation and Professional Computer line, Wang guarantees us a 10-day turnaround on shipping time."

In turn, Informatics allows its own customers to call in over the phone, writes up a supplementary order right away, and amends the customer's contract immediately. While Wang is filling the order, the customer is returning his copy, so the equipment can arrive at the user's door quickly. Fast turnaround is essential to Informatics' business. "Personal computers and workstations are really hot items, and when people order them, they need them right away," Lane says. "The competition is on street corners these days." Adds MacPherson, "In many cases our customer could go to someone else and pick up equipment that day or the next day. That's why it's important we expedite the order."

Discounts based on volume alone give the var more flexibility to buy the specific product he needs.

GIRARD OF WANG: The manufacturer finds vars "very active and vocal" in wanting a piece of the aftermarket.

Changing the way discounts to vars are handled can also aid in aftermarket sales, says Farwell of Data General. "Discounts across the corporation tend to be based on dollar volume or quantity of product. In fact, we are tending to move more toward the volume of business approach because that gives the customer a lot more flexibility to buy our product line—to buy the specific product he needs as opposed to a quantity of a particular kind of product."

IDENTICAL PROGRAMS AT HP

At Hewlett-Packard, aftermarket support is considered less important than making sure that the programs offered resellers are identical to the programs provided to the direct sales force. Explains Jim McDonnell, manager of HP's commercial third-party program, "If we have a special incentive program for upgrades, we announce it simultaneously through all of our sales channels, so we do not hinder our resellers or give them any less advantage than our own HP sales force. They get all the sales tools and training manuals that are available to the direct force. And new products are announced through the entire sales organization."

HP has set up a special marketing relationship with some of its vars, however. "Hewlett-Packard, up until a few years ago, really didn't have too much focus on working with third parties. But HP decided about two years ago—which coincided with the time we became a public company and were putting our marketing program together—to really cooperate with their third parties," says Bob Carroll, executive vice president of Richardson, Texas-based CompuTrac Inc. Today the hardware manufacturer has more than 450 third parties worldwide. The nine-year-old var has a very close formal relationship with HP. The vendor, which performs hardware maintenance for CompuTrac, lists the company in its National Program Directory as one of 18 prequalified var and software suppliers. Further, Carroll says, HP will generate sales leads on existing accounts for the reseller, and generate new sales leads as well.

This cooperation is especially important for CompuTrac, which has 150 installations in the legal field but only three direct sales people. Included in the feedback is information on which customers are ready to be upgraded from the HP 1000 to the 3000, a big-ticket item.

Aftermarket business is about 20% of the firm's total revenues right now, Carroll explains. But the var expects to place more emphasis on the area as soon as support staff are trained. Until now, "we've only done blue bird business, where people call in and want to add something, or where HP sees a need," he says.

IBM has had a reseller program for only five years, and a value-added distribution system since the introduction of its Personal Computer. Although an aftermarket can develop in a short time, Big Blue apparently hasn't given much thought to any extra help its vars and vads might need to mine this field's potential.

"IBM's marketing support for vars includes a national on-line prospect referral system, technical assistance, maintenance for selected products, sales and business training for managers and staff, consultant seminars, promotional literature, business shows support, advisory counsels, and opinion surveys," reads a statement.

Company spokesman Rick Bause adds that IBM direct sales staff has frequent contact with var end users. What happens when IBM perceives a need for an upgrade, say, in a shop that has a System/36 and is ready for a System/38? "It depends," says Bause. If the var is a "System/36 only" reseller, then IBM direct sales would get the upgrade business. If the var can deal in both machines, then IBM would probably refer the account back to the reseller.

Typically, IBM vars and vads haven't been in business long enough to feel the effect of Big Blue's upgrade strategy. For example, IBM vad Technical Marketing Systems, in business since 1983, goes after seven vertical markets including churches, real estate offices, and attorneys. Says Susan Hassell, marketing manager for the Nashville-based concern, "Most of our business is in the vertical hardware/software initial sale as opposed to follow-ups."

The manufacturers tend to place varying degrees of emphasis on the need to provide supplies to resellers. Says Hewlett-Packard's McDonnell, "Most of our vars don't really mess with supplies a whole lot. Most people who buy large volumes of those things wind up cutting their own deals locally." Generally speaking, HP vars aren't set up to handle orders that tend to come in high volumes, low dollars, and small pieces, says McDonald. Agrees CompuTrac's Carroll, "When you get into a volume business like supplies, it's not worth your while to administer it."

Adds Yankee Group market analyst Michael Goulde, "Vars usually handle supplies as a matter of convenience to their users." Statistics show, however, that there is a markup in the suppliers area of 30.1%, second only to the profits for software.

DEC'S ADVANCED PROGRAM

Recognizing the potential profit to be made, DEC instituted what it calls a "very aggressive program" to support its vars with supplies. "We offer resellers supplies agreements that allow them to make appropriate margins—from 28% to 40% depending on the item—so they can go out and sell supplies to their customer base," a company spokesman says. DEC also provides its vars with a catalog listing all supplies products and will preprint the reseller's name on that catalog so that customers will go back to

CARROLL OF COMPUTRAC: This var depends on its oem for sales leads on existing and new accounts.

"Vars usually handle supplies as a matter of convenience to their users.

the var rather than the manufacturer.

Similarly, Data General works with vars to allow them to set up their own DG Direct programs in which "their customers can call them for paper, ribbons, diskettes, cartridge tapes, and so on. [The resellers] then have a blanket agreement with DG so they can get those products on a timely basis," DG's Farwell explains.

The Wang Direct program also encompasses supplies, Girard says. A supplies catalog will be offered to vars. In the past, when this service was provided to Wang's own customers, "90% of our orders went out of the door in 24 hours or less. And 95% were in the customer's hands within five days of receipt of the order," Charlie Laing, director of Wang product marketing, boasts.

Data General, for one, has placed a great deal of emphasis on getting information out to its vars. At its annual Systems Supplier Conference this month, the firm is sponsoring a seminar on how systems suppliers can develop the aftermarket. What will the oem tell them? "That it all stems from system support. I think a lot of our vars have not believed that they needed to continue relationships after the system was installed. They believed they could leave the servicing of the hardware to DG and go out after new business," says Farwell. "But for a minimal amount of cost, we can help them keep their customers informed and help them maintain visibility with those customers." DG can supply resellers with consultation, brochures, and newsletters with articles and pictures oriented toward the resellers' particular markets.

An information campaign is an important part of Wang's strategy, too, says Girard. "We are very close to moving 20% of our hardware through independent sales organizations. While this is weighted to new installations, for some of our established resellers with a large customer base, as much as 50% of their business is in the form of upgrades and add-ons."

Wang sends its resellers a bimonthly publication called *Var Flash* that shows them new prices or new product offerings. If there is a sudden change in pricing or a new product release, Wang sends out a *Var Gram*, an overnight letter, so that the resellers can begin to promote the product "pretty much in sync with our own sales organization," Girard says.

None of the vars contacted for this article felt left out of their vendor's information flow. Sums up Ask's Manion, "We get our information almost as promptly as the direct sales force does."

Hindering the aftermarket, Jones of Agency Datasystems points out, is poor resale value for items already out in the field. In response, his firm is trying to set up its own program to help its users donate some of their used equipment and get a write-off. Wang, for one, has taken an aggressive stance on this issue. In order to encourage resellers to upgrade their customers to Wang's VS100, the firm devised an incentive program that gives computer owners the ability to trade in their VS80 minis through their vars. Wang either offers vars a fixed trade-in allowance of $6,500, which is good toward the purchase of add-on equipment, or a varying schedule of allowances based on what's being traded.

Explains John F. Deutsch, marketing manager for var business development at Wang, "If you are going to buy a disk drive that has a value of $12,000 retail, the first thing the var would do is take a regular var discount, which ranges from a low of 12% to a high of 36%. With 30% as an average, the cost would come down to $8,400. Then he could take $6,500 from that, so the cost of the disk drive to the var would be $1,900." Or, he adds, the var could take its 30% off the average price of a VS100, say at $100,000, yielding a price of $70,000. If the var is trading in a 384K VS80, "we are giving him an allowance of $10,140. He's buying that system for about $60,000." For resellers to pass on the savings to customers, title to the system has to be passed back to the var. Deutsch says, "You can't trade in what you don't own."

FIG. 1

AFTERMARKET OPPORTUNITIES

How to read the chart: 40.2% of var customers bought more than one system at the time of initial purchase; 32.2% returned to the var within two years for an additional system or upgrade.

	AT INITIAL PURCHASE	RETURNING WITHIN TWO YEARS
Another System	40.2%	32.2%
Main Memory	79.0	36.7
Workstations	70.4	44.6
Disk Drives	83.6	38.1
Printers	82.9	37.1
Modems	51.8	25.8
LAN Hardware	29.1	23.6
Software	89.2	65.5

Source: The Yankee Group. Based on survey of 1,189 systems integrators, oems, remarketers, and value-added dealers and resellers

THE VARS' POINT OF VIEW

Despite vendors' good intentions to help their resellers clean up on the aftermarket, vars have their own points of view, born out by Yankee Group statistics. Resellers consistently rate product features as very important in selecting a supplier for peripherals, but goodies like cooperative advertising, training programs, availability of third-party software, and direct service to the end user tend to come in last. The Yankee Group survey lends credence to the notion that many vars view vendor support more as interference then help.

Says Ask's Manion, "The only thing that the vendors could be doing that they're not doing is to stop trying to compete with us for the same market. If we sell an account that is buying our software and their hardware through us, we'll find a lot of times that the DEC rep or the Hewlett-Packard rep is going after the same add-ons business," he adds. "They force us into discounting more than we'd like."

Agency Datasystems' Jones suggests that the vendors could develop products as add-ons to older equipment "that would be good for both of us." Acknowledging the vendor's strategy to move on to new technology, Jones points out that there are some users who just won't move to new machines, but "they might move to a new terminal or disk drive or printer if it were backward compatible. Sometimes you have to help a guy out to the next step."

Officials at San Jose's Altos Computer Systems, which supplies multi-user systems and works only through var channels, say aftermarket sales represent about 15% of their business right now. Its strategy to help sales in the aftermarket is nothing more than providing a long-range upgrade path, so its system will grow as the customer grows.

Tom Anthony, vice president of reseller sales at Altos, says, "What we normally do is make sure our systems are designed so that they are flexible enough and easy enough to upgrade in the field so we don't cause any traumatic experience to the end user as a result of his need to upgrade." ◉

Esther Surden is a Guttenberg, N.J.-based writer who has specialized in the computer industry for 12 years.

Educators demand greater product sophistication as the market matures.

COMPUTERS IN THE SCHOOLS

by Edith Holmes

The year 1983 marked a turning point in the education market for personal computers and software. In that year, the industry saw a tremendous surge in the number of public elementary, junior, and high schools using the technology: microcomputer use spread to 90% of the nation's school districts from 40% the year before. Clearly, computers in classrooms were no longer "a fad, a flash in the pan," says Anne Wujcik, director of educational research for Talmis, a New York-based subsidiary of International Data Corp. All of a sudden, "we weren't talking about schools pioneering in this field anymore, but about getting on the bandwagon."

Since then, the micro population in the schools has more than doubled, from 291,000 units in June 1983 to 630,000 units in June 1984. By the close of the 1984-85 school session, Talmis found more than 1 million personal computers in place (see Fig. 1), and these figures do not include the micros being used in private schools or by college students. Meanwhile, the market for educational software to run on these machines is growing by leaps and bounds—increasing from $43 million at the end of the 1982-83 school year to $97 million at the close of the 1983-84 session and reaching roughly $150 million by June 1985.

As the number of micros has increased, so has the sophistication of the educators. Teachers and administrators are demanding an increased level of support from hardware manufacturers and innovative programs from software publishers. As a result, drill-and-practice math programs are no longer enough; hardware that does not accommodate a sizable software library is out of the question.

The vendors making pitches to the schools include the key hardware manufacturers in the business and home markets and more than 100 software publishers. Market researchers believe that those that will come out on top in hardware are Apple Computer Corp., Commodore International Ltd., and IBM, while Tandy Corp. loses market share, Atari Corp. struggles to retain its installed base, and the American subsidiary of Britain's Acorn Computers Ltd. virtually vanishes from the United States' education market.

FIG. 1

COMPUTERS IN U.S. SCHOOLS, GRADES K-12

YEAR	NUMBER OF MACHINES
1981	33,000
1982	125,000
1983	291,000
1984	630,000
1985	1,075,000 (estimates)
1986	1,550,000
1987	2,000,000
1988	2,400,000
1989	2,850,000

. . . AND HARDWARE IN PLACE AS OF JUNE 1984

COMPANY	MARKET SHARE (%)
Apple	48
Tandy (Radio Shack)	19
Commodore	18
IBM	5
Texas Instruments	4
Atari	3
Other machines	3

Source: Talmis

Where software is concerned, smaller program publishers who ally their firms with Apple or IBM or one of the major educational textbook publishers—among them Addison-Wesley, Milliken Publishing, Random House, Scholastic, or Holt, Rinehart & Winston—should do well. Companies forging such alliances or already enjoying a reputation for quality educational software include The Learning Company of Menlo Park, Calif., and Sunburst of Pleasantville, N.Y.

Cupertino, Calif.-based Apple led the way in the education market and today dominates the hardware field with a 54% share (see Fig. 2). "Apple has continued to consolidate its position in the school market. For the short term, the company has no competition," comments Wujcik. Talmis estimates that Apple captured 65% of the 1984-85 kindergarten through twelfth grade (K-12) sales. Further, adds Wujcik, "the schools tell us that as much as 70% of their 1985-86 purchases will be with Apple."

Battered by its dealers into retreating from a direct sales assault on IBM in the business market, Apple has reaffirmed its commitment to the schools, returning some of its salespeople to the education market. The company also hopes that sales to students will translate into sales to their parents. Apple's education sales manager, Michael Mount, cites research suggesting that for every micro sold to a school, four additional machines are sold into another market, such as the home or a small business.

Aiding Apple in its pursuit of this market is the huge list of third-party education software programs—more than 2,000 titles—written for the Apple II family. Indeed, most new education packages are developed first for Apple's machines. Educators also applaud the compatibility the company has maintained between the Apple II, the II Plus, the IIe, and the portable IIc. The company offers schools discounts

Hardware that does not accommodate a sizable software library is out of the question.

that range from 20% to 40% depending on the volume of the purchase and the age of the product. Apple also sells 10-copy packages of some of the more popular education software, such as Apple Works, Scholastic's Bank Street Writer II, and Southwestern Publishing's Alphabetic Keyboarding.

ON-SITE TRAINING AVAILABLE

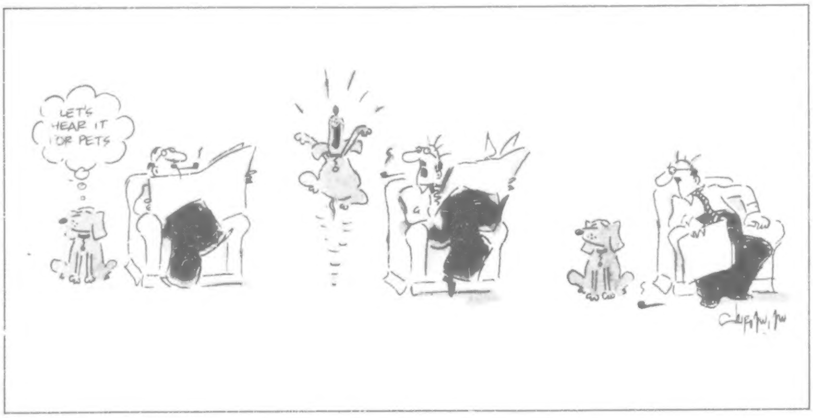
Schools interested in buying Apple's products place their orders directly with the company and designate local dealers with whom they wish to do business. Acting on Apple's behalf and paid by the firm, the dealer is then responsible for equipment installation and training. Apple makes training rooms available in its various sales offices to ensure that key administrators, supervisors, and teachers know how the equipment they have purchased works. On-site training and assistance can be had, too, revealing Apple's recognition that this market requires special handling. The company just completed a six-month Teacher Training Scholarship program in which 10,000 instructors received a total of $100,000 to take courses to help them integrate micros into their classrooms. "You don't sell to the education market and then walk away from it," says Mount.

Currently holding second place with an 18% share, West Chester, Pa.-based Commodore will work hard to maintain its piece of the market, according to Talmis. "The Commodore 64 sold adequately in 1984 and 1985, but the schools did not flock to it," says Wujcik. "The software supply for the machine is just not that exciting." Further, the company has made a point of offering neither free services nor volume discounts to the education market. Instead, the firm's basic philosophy is to sell all of its computers at a low price.

Though attracted to Commodore's low prices, educators have damned the firm for failing to make its Vic-20 micro compatible with the Commodore 64. The company appears to have taken such criticism to heart. "Schools want and need products that will work with what they already have. Our new Commodore 128 is totally compatible with the Commodore 64," says Patricia Walkington, manager of education marketing. In addition, the machine has a CP/M option, enabling users to run the many educational packages available with that operating system—including advanced languages, such as Pascal, that are so popular in the high schools. At $969 with a single disk drive and a color monitor, Walkington believes that the Commodore 128 is "extremely competitive" with comparable equipment from Apple and IBM. Production of the 128 has begun and will keep pace with orders, according to the company.

Talmis feels that by selling the 128 to the education market, Commodore will maintain its position in the schools. In fact, the company sees education as a primary market for its new machine. Says Walkington, "We are marketing the 128 to the secondary schools, particularly those getting into computers for the first time."

Losing out to Commodore for number two and now in third place in terms of market share, Tandy Corp. of Fort Worth appears to Talmis and other market researchers to have lost momentum in the education market, perhaps because of Apple's continued success and IBM's strong 1984 entry into this field. Understandably, William Gattis, vice president of Tandy's education division, disputes their findings. "None of the market researchers agree, and the variations in their figures are not minor," he says. "We're number one in a number of state department of education surveys." Gattis warns software publishers about making business decisions based on faulty market research figures.


LET'S HEAR IT FOR PETS

CARTOON BY VAHAN SHIRVANIAN

Tandy's biggest seller in the schools is its Radio Shack TRS-80 Model 4, which includes a good bit of software, a lower price as of the beginning of this year, and Network 4, a high-speed classroom network. But the firm is also beginning to sell its IBM-compatible Model 1000 to this market and last June cut the computer's price to a more attractive $999. "Though it won't replace the Model 4 in the schools," says Gattis, "we think the population of 1000s will grow in the next few years."

The firm's in-house software development team has designed more than 145 programs for the classroom and has over 100 packages on its drawing boards. In addition, the firm has joint product development efforts and marketing agreements with over 80 educational publishers.

Tandy also has made training a key part of its sales effort. Over the past three years, the firm has helped more than 400,000 teachers at Tandy-equipped schools to become computer literate at no additional charge. Regional education coordinators work full-time with the schools, conducting seminars, workshops, and in-service training. Tandy's 450 computer centers across the country also offer courseware preview libraries, which permit teachers to see educational programs and documentation before they buy. The firm has a toll-free hot line for after-sales assistance to the education community.

MICRO BASE IS AT RISK

Atari Corp.'s financial woes have threatened its 2% base of micros installed in schools. Talmis contends that Atari failed to sell any of its personal computers to the education market in 1984 and 1985 and that schools with Atari equipment have had no support for nearly two years. Indeed, school districts report they are having difficulty getting spare parts.

Purchased over a year ago from Warner Communications Corp. by Jack Tramiel, Commodore's ousted founder, Atari may attempt to win the schools back with its new ST computer line, "but the company has to do a lot of fence mending with educators," says Wujcik of Talmis, "in addition to rebuilding its distribution network." Officials at the Sunnyvale, Calif., firm will say only that they intend to market their products to the education field.

Lumped in with "other machines," Acorn Computers' $995 micro is judged by all to be a very powerful machine for the money. But industry observers say Britain's 8-bit, 2MHz 6502 processor-based personal computer with built-in 32K RAM and

"You don't sell to the education market and then walk away from it."

ROM, memory expansion interface, music and speech synthesis, BASIC, word processing, parallel and serial ports, eight display modes, and networking capability just hasn't sold educators.

Acorn, which has a repertoire of 500 software titles and a 10-week course for teachers, is losing money in the U.S. market and has been rethinking its presence here. Indeed, the company completed a $19.5 million financial restructuring earlier this year, which included the purchase by Italy's Ing. C. Olivetti of 49.3% of the company for $11.2 million. Olivetti upped its share of Acorn to 80% in August. Key to Olivetti's involvement is its financial muscle and its promise to help Acorn crack overseas markets such as the United States.

Meanwhile, Frank Murphy, director of marketing, gives every indication that the company's Woburn, Mass., unit will continue in this country, primarily in the education market. This year, he says, Acorn will stress networked software, with programs that can be correlated with its textbooks. Murphy acknowledges that, because of the sophistication of Acorn's product, "we tend to do much better with people buying for the second time." Wujcik no longer considers Acorn a major player in this market, however. Sales for 1985, Murphy admits, are "relatively flat," but he hopes that Olivetti's new commitment will improve Acorn's negative financial image.

Still toward the bottom of market share charts, IBM is believed by all to be a comer in the education field—though not immediately. Some estimates put IBM's share of the market within the next two years at 15% and call that figure conservative.

In the summer of 1984, IBM expressed its "commitment to the education marketplace" by unveiling a good bit of software designed for education. Through its Entry Systems Division, the firm formally announced the Writing to Read program, a language laboratory built around the PCjr and aimed at teaching kindergarten and first grade children to read and write. IBM tested this software for two years in 225 schools around the country and enlisted the aid of Educational Testing Service, Princeton, N.J., to evaluate it before releasing Writing to Read as a product.

The company also introduced eight other educational packages for its PCjr, six of which were written by independent software companies and educators. The packages include a program created in-house that lets teachers design quizzes and tests and track student performance, and software called Rocky's Boots, an educational game developed by The Learning Company that teaches the basics of computer logic and electronic circuitry.

IBM VOWS TO MATCH PRODUCTS

IBM pledged to continue using third-party software developers wherever possible and to look for software that matches what educators are trying to teach in the classroom. "Our interest has been and will continue to be in software that is curriculum-based, that carries the content through the entire semester or year," says an IBM spokesman. In addition, the company believes that in-service training in the use of computers is critical for teachers. It has a video training service, as well as a major training center in Atlanta.

But Big Blue has a problem in this market. After dropping the price for a PCjr well under $1,000, upgrading its memory to 128K, and redesigning its keyboard, IBM pulled the plug on its low-end PC. The company announced last spring that it would stop manufacturing the machine. The announcement came just as PCjr began to attract some major school purchases, leaving educational buyers feeling confused, even betrayed. "The PCjr remains one of our key products in this marketplace," contends company spokeswoman Pam Evans. She adds that although the machine is no longer being made, IBM doesn't foresee that it will run out of its inventory in the near future.

Since the decision to drop jr, however, IBM has revised its strategy in this market. At the end of April, the company "consolidated its K-12 marketing effort" by forming an independent business unit, based in Atlanta and devoted to this field. Called IBM Educational Systems, the organization is led by James Dezell Jr., who is vice president of IBM's National Marketing Division and general manager of the new education organization. At the same time, IBM expressed its continued interest in this market by unveiling 24 educational software packages, including a 10-program Biology Series, a four-program Private Tutor Math Series, and a three-program Private Tutor Language Arts Series. All of this software was written in-house.

Industry observers say IBM has abandoned any attempt to sell standalone machines. The company is now said to be concentrating on selling large- and medium-sized processors to the schools for administrative applications. With enough processing power, these machines can also drive networks of, say, 30 Personal Computers. And in that mix of PCs, the company will continue to offer some PCjrs. IBM spokeswoman Evans acknowledges that "the key machine in the school district is the mainframe," but, again, stresses that PCjr is still IBM's machine in the classroom.

Of the systems approach, says one analyst, "certainly, IBM has sold computers this way forever, and it will work with educators, too." But most observers expect it to be a marketing approach that will require "a- couple of years" to generate results.

Available now for more than a year and a half, Apple's Macintosh technology with its mouse, pull-down windows, and icons is "very appealing" to the schools, according to market researchers. In fact, Apple has succeeded in selling its innovative machine to several colleges, including Drexel University in Philadelphia. But industry observers agree that the company won't be able to sell the Mac at its current $1,800+ prices to elementary, junior, and high schools. Apple says it doesn't expect

WHAT'S NEXT FOR SCHOOLS

With the schools' lukewarm response to networking, two quite different technologies—videodisk and compact disk/read-only memory (CD-ROM)—are among the best bets for future sales to schools, say analysts who follow this emerging market. Both formats are essentially publishing media that make vast quantities of stored information easily available to students.

Videodisk is the older and more mature format and is leading the move into the educational marketplace. Education currently accounts for less than 10% of the videodisk market, according to Linda Helgerson, a McLean, Va., analyst who has recently published a study of the field, but she predicts a booming educational market in the future. "Educational uses of videodisk should grow to at least one fourth, probably one third, of the total market. After industrial training and point-of-purchase, education is going to be the next biggest application."

Videodisk offers educators the opportunity to store 54,000 still pictures, or motion video, or a combination of several media and narration. When hooked to a computer, the videodisk can become part of an interactive learning tool. But this is not simply programmed learning; the software can individualize the material and the speed at which it is presented.

More important for its chances of acceptance, an inexpensive player can be connected to any computer with an RS232 port. "The acceptance of videodisk hardware is totally dependent on the software," says Helgerson. "Schools will purchase the systems when there is good software available. What we've had to date is a few—very fine, but only a few—attempts at producing videodisk-based software for the K-12 setting."

Facing the familiar chicken and egg problem, several nonprofit educational organizations are trying to prime the pump by funding and making available high-quality videodisk software.

The National School Boards Association (NSBA) has established an Institute for the Transfer of Technology to Education. One of institute's first jobs will be to obtain corporate funding for a series of science and technology videodisks that could be used in the classroom. NSBA plans to produce 20 lessons each on biology, chemistry, and physics. After the disks are completed, the product would be either given away to schools or licensed to a for-profit company to market.

NSBA is also seeking funding from the U.S. Department of Education for model centers that would compare technology-intensive education with conventional instruction.

How long will these pilot projects take to make a substantial difference in the market? Rockley Miller, editor of the *Videodisk Monitor* newsletter, thinks the effects will be seen in 18 months to two years. A change in demographics—"the baby boom boom that will produce more children under five in the coming years"—fewer teachers, and a talent drain on the teaching profession by private industry, all contribute to a coming crisis in education, says Miller. Schools will need to depend on technology as a result.

Anne Wujcik, director of educational research for Talmis, a New York-based subsidiary of International Data Corp., is more conservative. Schools are looking at videodisks and at CD-ROM, she says, but they are not ready to buy. The big change should happen when schools are ready to get rid of five-year-old Apples.

CD-ROM may have to wait for the next generation of computers for other reasons, as well. Brand-new in the marketplace, CD-ROM drives will not reach production quantities until next year (see "New Lights on the Storage Front," Sept. 15, p. 84-17). Almost all the interfaces and software currently prepared for CD-ROM are for connection with the IBM PC. Other interfaces are possible, of course, but the early marketing push has been to the business and vertical market, and IBM is the dominant force there. New machines, however, such as Commodore's Amiga with its sophisticated graphics, sound, and MS/DOS interface, may prove to be good candidates for applications using CD-ROM.

Several companies are trying to shorten the time lag between equipment introduction and the availability of good application products. Activenture of Pacific Grove, Calif., developed the software for Grolier Electronic Publishing's Academic American Encyclopedia on CD-ROM. Even with 21 volumes, index, and search software on a CD-ROM disk, there is still empty space on the disk—more than enough for a dictionary and a thesaurus, plus some word processing software or a spreadsheet. And Grolier executives are considering adding some or all of these features to the next version.

Atari used the encyclopedia on a disk as part of its demonstration in June of the new Atari 520ST. At the time, showgoers commented that the linking of the encyclopedia and the computer was the first good reason in a long time to buy a personal computer.

The economics of CD-ROM are its biggest advantage. As drives fall to less than $300 in oem quantities, schools may discover that the price of the drive and the disk is less than a traditional bound encyclopedia.

That type of linking spurs other companies as well. Compact Discoveries in Delray, Fla., is developing a whole series of application programs designed to be both low cost and consumer oriented. The idea is for computer or CD-ROM hardware manufacturers to give the programs away or charge a nominal fee for them when they sell the hardware.

In the future, educational publishers might consider reversing that idea—as a version of the free razor given away to prompt blade sales—and heavily discount sale of the CD-ROM hardware as a means of assuring steady sales of educational software on disk.

—Anne A. Armstrong

to win this market right away. Susan Talley, education program development manager at the company, says, "We think that as the Mac becomes a standard in colleges and universities, it will receive greater attention in secondary schools."

But other companies may well take the K-12 market first. Both Atari and Commodore have introduced Mac-like machines that are priced to be competitive with the Apple IIc and the IBM PC, let alone the Mac. They could find their way into the education market. Unveiled early in January, the Atari ST line (nicknamed the Jackintosh in honor of Atari chief Jack Tramiel) begins with a base price of $300 for 128K of main memory. With a single disk drive and low-cost color monitor, the 520ST sells for $800. Commodore, meanwhile, plans a fall market entry for its $1,295 Amiga personal computer, which includes a built-in drive and mouse. "We will definitely sell Amiga to the university market and expect the machine to find its way into K-12 schools that have had computer technology programs for a number of years," says Commodore's Walkington.

PRICE IS NOT ENOUGH

The potential of Mac technology for use in grades K-12 remains uncertain, though. Price alone is not enough. "Schools are leery about new machines," says Wujcik, "and the lack of educational software for the Mac and its look-alikes is a problem. Schools can't justify machines without software." Talmis anticipates that high schools will buy at least one Mac or its equivalent to experiment with the technology. But the market research organization does not expect to see the effect of these machines on the marketplace until the end of the 1985-86 school year.

Confirms Jane Manzelli, curriculum coordinator for computer science, K-12, in the public schools of Brookline, Mass., "The Mac is really a manager's tool. Schools just aren't that sophisticated." But other school officials disagree. Patricia Sturdivant, associate superintendent for technology in the Houston Independent School District, comments, "I think Apple's making a mistake by not trying to market the Mac to the schools. It's true it doesn't offer color or a reservoir of software, but there is definitely a place for it. A Mac would be a wonderful tool, for example, in an art or a journalism class." Commodore's Amiga and Atari's 520ST may find a home in large school districts like Houston's.

While the leading hardware companies in the education field are easy to spot, the top software firms are tougher to discern. To begin with, the makers of micros publish programs too. Tandy and IBM, for instance, both link hardware sales to the software that runs on their machines and

"Apple continues to consolidate its position in the school market."

are actively developing and licensing programs for this market.

The software companies most likely to succeed with educators will be those that move away from drill-and-practice programs toward packages that encourage children to be creative or that provide useful tools. Pamela Skinner, project director of Cupertino Concept: Computer Literacy, the Cupertino Union School District's program for putting micros in the schools, comments, "Much software still falls into the drill-and-practice category. But the wonderful side of computers is their ability to give children opportunities to develop critical thinking skills." Across the country, Manzelli of the Brooklyn public schools adds, "We don't use any drill-and-practice programs except in special help classes. Our goal is to improve the thinking process in children."

Among the companies with a reputation for quality software are Sunburst, which writes programs such as Factory and Pond that teach perceptual thinking, and the Learning Company, author of Rocky's Boots. So successful has Intentional Educations Inc. of Watertown, Mass., been with its Bank Street Writer word processing package that other companies are now rushing to develop additional tools aimed at students and their teachers (see "DBMS for Kids," April 15, p. 70). Scarborough Systems Inc. of Tarrytown, N.Y., Grolier Electronic Publishing Inc. and Scholastic of New York City, have introduced database management programs and ready-made database files for children. And, following the example set by E. David & Associates of Storrs, Conn., with Kid Calc three years ago, Grolier made a spreadsheet for children available in April. "These kinds of tools are currently *the* software products in this market," says Wujcik.

The software firms that will do well in the school market also will be those that reach agreements with the traditional textbook publishers that teachers recognize and respect. IBM, for example, has a "joint marketing venture" with Prentice-Hall in Englewood Cliffs, N.J., to publish workbooks to go with software written for IBM's PC family. The five-year-old Learning Company has signed a marketing agreement with Addison-Wesley, Reading, Mass., that calls for the book publisher to distribute several of the software firm's titles in packages specifically directed at the schools. And Software Publishing Corp. of Mountain View, Calif., well known for its "pfs" business software, has reached an agreement with Scholastic whereby the education publisher will market pfs to schools.

MAY AVOID EDUCATION MARKET Without such connections, some software firms may even avoid the education market. Though praised for the quality and creativity of its programs, for instance, Spinnaker Software Corp. of Cambridge, Mass., has no intention of pursuing the field other than on the periphery. President C. David Seuss figures that a built-in distribution channel or a direct sales force already selling to the schools is essential to compete in any cost-effective way.

Another issue facing the schools is whether to network their microcomputers.

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It happens in children as well. Things like rheumatic heart disease and congenital heart defects. Each year, nearly one million Americans of all ages die of heart disease and stroke. And 20,000 of them die from childhood heart diseases.

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Thus far, there appears to be little networking going on, although observers predict such links will increase with the population of micros in classrooms. "The concept interests people, but most schools don't buy enough equipment at any one time to network," says Acorn Computer's Murphy. He believes that no more than 10% to 12% of the education market is seriously interested in networking right now. To network cost-effectively, schools need a minimum of eight or nine personal computers, and Quality Education Data Inc. of Denver, estimated at the beginning of the 1984-85 session that 15,000 public schools had that capability. Still, "if the use of computers in the schools is to grow, we will have to be able to use networks," says educator Sturdivant, who has field tested four networks and has yet to find a satisfactory communications solution for her school district's population of some 6,500 microcomputers.

Some schools, such as those in Brookline, have networked from the beginning. Brookline has eight schools, each with its own Corvus Systems network linking Apple II+ and IIc micros and a Hewlett-Packard mainframe in the high school. By pioneering in this way, the school district has encountered two major problems that are likely to limit the growth of education networks for some time: the availability of software that can be networked and the price for the packages that can be linked. "None of the straight drill-and-practice, computer aided instruction stuff can be networked," says Manzelli. That's another reason why the Brookline schools have stayed away from such packages.

In general, Manzelli has not found manufacturers "too responsive to our networking needs." Price is a major factor, she says. "Networked software tends to be outrageously expensive. Publishers want to charge between $400 and $700 per net for one package. We have to really want a program to pay that much." There are exceptions, however. The Brookline schools currently are pilot testing a networked version of Bank Street Writer, for example.

One of the rationales behind the high prices set by manufacturers is that schools are major sites for pirating software. Even though Spinnaker, for example, sells 95% of its products into the home, 75% of its piracy cases come from educational institutions. Faced with limited budgets, teachers have photocopied magazine articles and book chapters for years; now they are duplicating disks.

Piracy makes it tough for publishers to get the return they need on their investment in software—and costs sometimes run as much as $100,000 for a single program. Networking seems to these manufacturers to create an identical problem of recouping research and development costs. Hardware makers, meanwhile, are elated at the potential that networks hold for the use by the schools of more and more machines. To them, networks will be a boon. ●

An independent survey of DATAMATION's readers reveals that almost half of those polled do some of their work at home.

DO YOU TELECOMMUTE?

by Margrethe H. Olson

Who is telecommuting? Why? Last winter we conducted a survey of DATAMATION readers to answer these questions. The majority of articles about telecommuting have focused on people in the computer-related professions, under the basic assumption "have terminal, will travel." In other words, if you can do all your work from home once you have a terminal or personal computer and modem, why not work there? Assuming the jobs of many DATAMATION readers would lend themselves to telecommuting at least some of the time, we conducted a survey to find out if anyone is taking advantage of this flexible work option.

The answer is . . . yes and no. People in the computing professions are working as much as ever. And now some of the overtime work that previously had to be done in the office can be done at home. But people are not staying home instead of going into the office, at least not yet.

The survey questionnaire was sent to 5,000 readers; 958 were returned. Of these, 45%, or 434 respondents, claimed to do at least some of their work at home. Of those who did not work at home, the large majority, 60.5%, or 358 people, said they would like to work at home at least some of the time. A total of 97, or 16.4% of the respondents, said they did not want to work at home at all. We can assume that more people who do work at home were motivated to complete the survey than those who do not, although responses from both groups were requested.

The remainder of the results are reported only for those who work at home.

Although 28.1% of the respondents either classified their occupations as "other" or did not respond, the rest provided their occupations and the results are shown in Fig. 1. As many as 39% reported they have some dp management responsibility, 25.8% are computer professionals, and 7.1% reported other professions. As shown in Fig. 2, 35% of those who work at home are self-employed.

FIG. 1

RESPONDENTS' OCCUPATIONS

	Number	Percentage
Other*	122	28.1
Executive dp management	108	24.9
Midlevel dp management	61	14.1
Nonmanagerial computer professional	12	25.8
Other noncomputing professional	31	7.1

*Includes those giving no response

Is work at home a significant departure from the daily commute to a nine-to-five workplace? We learned that our respondents, like most computing professionals, work long hours. What is most interesting, however, is that although the average number of hours worked at home is equivalent to one and a half work days, the hours appear to be worked in addition to regular work hours. Most people have a terminal or personal computer at home and many have the capability to communicate with the company's in-house computer (see Fig. 3 for type of equipment respondents used at home). It appears that the one significant change in work habits is that overtime work can now be done in the convenience of one's home instead of at the office. This was true for both the self-employed and the employees; self-employed persons reported working 51.5 hours per week, 15 of them at home, as opposed to employees, who reported an average of 52.7 hours worked, 10.7 of them at home.

Fifty percent of respondents have a separate office at home (see Fig. 4) so they can work conveniently and relatively free from distractions.

Fig. 5 shows clearly that work at home is an addition to the regular workday. Only 12% of respondents stay home occasionally instead of going to the office, and only 10% work at home on a regular basis as a substitute for the office. Only 6% work exclusively at home. (It is not clear how a person who uses the home as a base but works primarily in the field, such as a salesperson, would respond to this question.)

Why did the respondents decide to work at home? As shown in Fig. 6, the reason most frequently given was to increase their productivity. Whether they found the office too distracting, were worried about not getting enough work done, or were constantly on deadlines, they chose to extend

FIG. 2

When you are working at home, are you:

	Number	Percentage
Employed by a company or another person	219	50.5
Self-employed	151	34.8
Other	64	14.8

FIG. 3

Which type of computer equipment do you have at home for work-related use?
(Respondents gave multiple answers.)

	Number	Percentage
Personal computer	303	69.8
Modem	187	43.1
Terminal	122	28.1
Word processor	69	15.9

FIG. 4

Where in your home do you most often work?

	Number	Percentage
Office in my home	217	50.0
Dining/living room	55	12.7
Family room	43	9.9
Bedroom	36	8.3
Basement	19	4.4
Kitchen	16	3.7
Other/no response	48	11.0

FIG. 5

Are the hours that you work at home:

	Number	Percentage
In addition to regular work hours	280	64.5
An occasional substitute for work at another location	54	12.4
A regular substitute for work at another location	43	9.9
All the paid work you do	27	6.2
Other/no response	30	6.9

FIG. 6

Why did you first decide to work at home?
(Respondents gave multiple answers.)

	Number	Percentage
To increase my productivity	244	56.2
To work in my own way, at my own pace	200	46.1
To earn extra money	135	31.1
To save time commuting	93	21.4
Tax benefits	62	14.3
To ease conflicts between work and family	61	14.1
Low overhead	48	11.1

FIG. 7

What are the advantages of working at home?
(Respondents gave multiple answers.)

	Number	Percentage
Increased productivity	291	67.1
More time with my family	155	35.7
More time to myself	134	30.9
More money	113	26.0
Increase career opportunities	88	20.3
Less personal conflict	61	14.1
Spouse pleased	59	13.6

their day at home to get more work accomplished. It can be assumed that they were not paid overtime for the hours that they worked at home.

FEW EARN EXTRA MONEY

Some of the respondents (31%) reported that they were earning extra money working at home. There has been some concern that having computer equipment at home might encourage employees to use it to moonlight for competitors. Anecdotal evidence does not show this to be a serious problem. Rather, many programmers work on their own products, each presumably hoping to make a hit with the next Lotus 1-2-3.

How do those polled like working at home? As shown in Fig. 7, 67% felt the opportunity to work at home did indeed increase their personal productivity. This result must be considered with caution. Strictly speaking, productivity is output per unit of input (hours worked), and the respondents may simply be extending their hours worked rather than increasing their output per hour. Interviews with people who work at home, however, show they do feel their actual productivity has increased due to the lack of distractions and interruptions in the home environment. Another reason is the increased leverage gained from being able to try any function, such as a program fix, at any time.

Almost 36% reported they also spent more time with their families when working at home. (It should be noted, however, that 64.3%, or 279, of the respondents had no children under five, and of those that did, only 3.7%, or 16 took care of them while they worked.) The rest of the home workers, 32% (139), did not spend any more time with their families. Instead, they preferred doing their overtime work at home just so they could share regular meal time with their families and be physically present in the evening hours, even though toiling over their terminals.

Work at home is not ideal. Fig. 8 shows its most frequently cited disadvantages. The biggest problem mentioned in the interviews is the tendency to work too much. The terminal or computer is close and inviting, and it's easy to put in just one more test run before going to bed. Electronic mail adds to this problem. We have been told of people turning on their terminals just to see who is on the system. The productivity benefits cited go hand in hand with this downside because the machine itself and the accessibility it provides the at-home worker are compelling.

Another frequently cited disadvantage of work at home is a lack of interaction with coworkers. The myth that programmers are solitary types, preferring their terminals to other people, has pretty much been dispelled over the years. In fact, programmers are very social types, and a primary topic of their conversation is how to use their computers. Thus, an important part of their learning and professional development is constant interaction with peers, and this is missed when work is done at home.

Overall, however, those who work at home seem to feel the advantages of having the option to work at home outweigh the disadvantages. As shown in Fig. 9, over 85% are at least somewhat satisfied with the opportunity to work at home. They do not want to work at home full-time, however, as shown in Fig. 10. The overwhelming majority favor the flexibility of being able able to work at home part-time but still work at a regular workplace.

Most respondents to the survey are male—89.6%, or 389 respondents, vs. 10.3%, or 45, female. A majority of the respondents—82.9% (360)—are married or living with a partner, while 17.1% (74) are divorced, widowed, or single. Fig. 11 shows the household income of the respondents.

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Based on this survey, is telecommuting common? In the computing profession, the one significant change in telecommuting in recent years seems to be that more people have access to computing in their homes, which makes it easier for them to put in longer hours. This is an interesting cultural phenomenon, but it does not mean that the office as we know it is disappearing and being replaced by electronic cottages. In the computing professions at least, work at home is a privi-

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People who have the option to work at home seem to feel the advantages outweigh the disadvantages.

FIG. 8

What are the disadvantages of working at home?
(Respondents gave multiple answers.)

	Number	Percentage
Work too much	173	39.9
Lack of interaction with co-workers	155	35.7
Less time to myself	72	16.6
Less time with my family	53	12.2
Resentment of my spouse	46	10.6

FIG. 10

What would be your ideal work arrangement?

	Number	Percentage
To work part-time in my home, part-time outside	309	71.2
To work only in my home	44	10.2
To work entirely outside my home	38	8.8
Other	43	9.9

FIG. 9

Overall, how satisfied are you working at home?

	Number	Percentage
Very satisfied	211	48.6
Somewhat satisfied	159	36.6
Somewhat dissatisfied	24	5.5
Very dissatisfied	3	0.7
No response	37	8.5

FIG. 11

What is your household income?

	Number	Percentage
$45,000-59,999	129	29.7
$30,000-44,999	111	25.6
$75,000 and over	82	18.9
$60,000-74,999	78	18.0
$15,000-29,999	24	5.5
No response	10	2.3

lege. It is voluntary and convenient. People do it because they like what they do and are happy to do it at home as well as at the office.

Although this conclusion is tentative, previous research shows that the technology to support telecommuting seems to be a limiting factor today. Despite having the use of personal computers and access to mainframe databases through dial-up lines, we do not work in an environment where all the resources we needed, including people, are accessible electronically. When electronic mail and voice store-and-forward become widespread, and most text-based resources (e.g., manuals, documentation, correspondence) become available on-line, more and more jobs in computing and other white-collar professions will become "location independent." At that point, we may see work at home, at least as an occasional substitute for working in the office, become commonplace.

Today, a significant barrier to regular work at home is lack of exposure to corporate culture. Employees need to feel a sense of belonging that is gained by walking through the office doors. More important, managers like to see their employees. A common complaint from managers regarding telecommuting employees is, "How do I know they're working if I can't see them?" One might ask, how do you know even when you can see them? ◉

Margrethe H. Olson is associate professor with the Graduate School of Business Administration at NYU. During the past four years, her research on telecommuting has focused on formal company arrangements for employees to work at home on a regular basis. She has surveyed a number of such programs through interviews with employees working at home and their management. Olson is currently completing a corporate telecommuting study sponsored by the National Science Foundation.